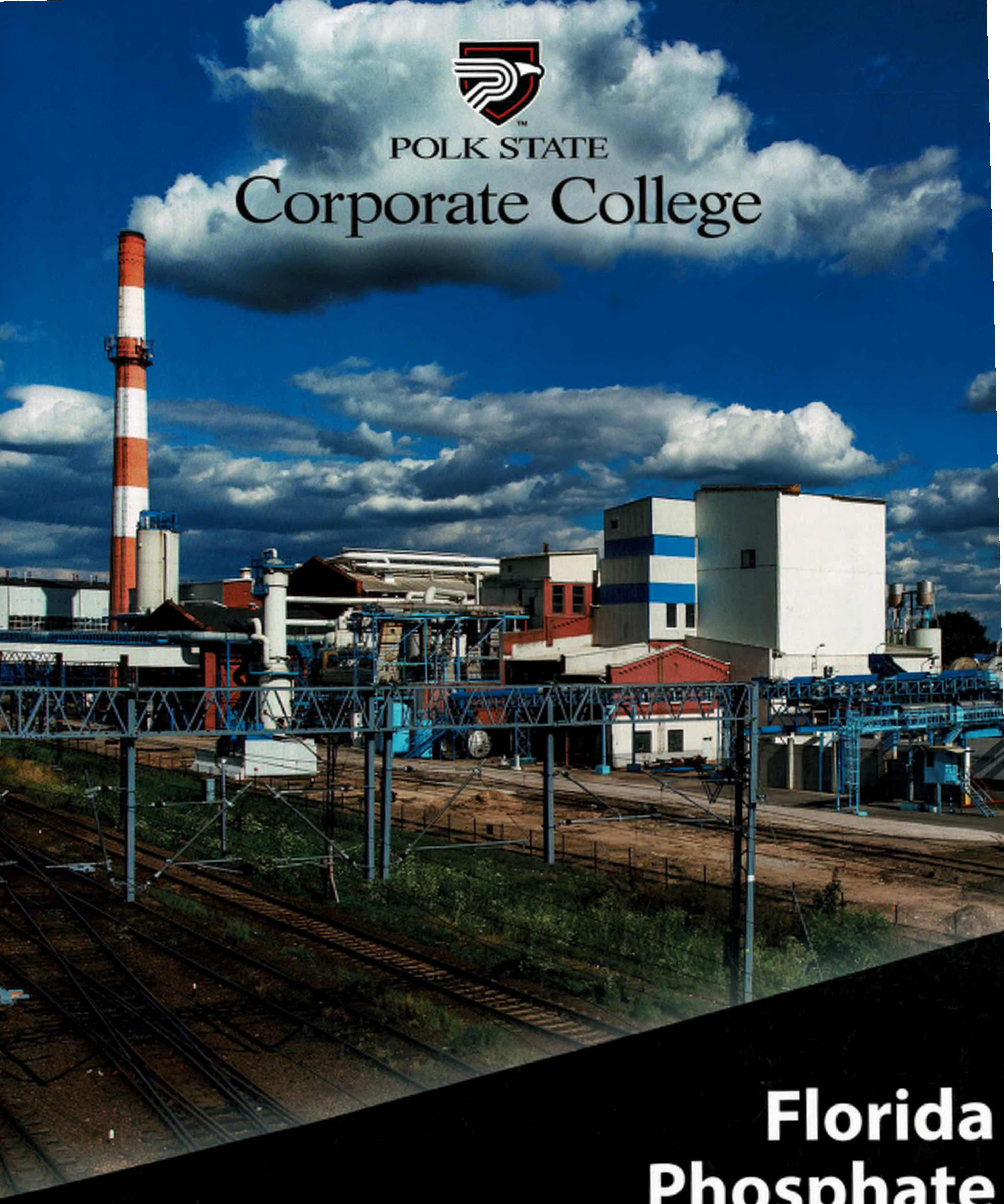
POLK STATE
Corporate College



Florida Phosphate Producers

Basic 16hr Program

CONTRACTOR SAFETY AND HEALTH TRAINING

The material presented in the Contractor Safety and Health Training Program is based on the standards of the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), The Compressed Gas Association (CGA), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Fire Protection Association ((NFPA), The American Society of Safety Engineers (ASSE) and the Florida Phosphate Producers (FPP) member companies safety procedures and requirements. This program is not to be considered a substitute for the full safety and health standards for general industry, published in the Code of Federal Regulations (CFR), Title 29, Part 1910, for construction published in the CFR, Title 29, Part 1926, or the individual Florida Phosphate Producers member facility's safety procedures, rules, and/or requirements.

Employers are required to provide additional health and safety training to its employees in order to comply with OSHA regulations. Training may include Respiratory Protection, Hearing Conservation, Fall Protection, Confined Space, Fire Extinguisher, HAZCOM, etc.

Additionally, employers are required to provide task training to its employees on the specific jobs the employees will perform. Task training may include safe operation of mobile equipment or working with specific tools or machinery.

CONTRACTOR SAFETY AND HEALTH TRAINING
16 HOUR PROGRAM
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INTRODUCTION

Contractors provide technical services, skilled and non-skilled labor to our industry when contracted by a Florida Phosphate Producers member facility. Contractors are valuable assets to the Phosphate Industry and must be provided with a safe place of work. Contractors are often asked to perform tasks which may involve hazards. Every contract company must be diligent in the pursuit of an injury free workplace. To assist contractor companies with their efforts to reduce accidents and injuries, the Florida Phosphate Producers have determined a need for training of individual contractor's employees.

The Florida Phosphate Producers have enacted a plan which will ensure that all contract employees complete a safety training program before they enter the workplace. Successful completion of the **CONTRACTOR SAFETY and HEALTH TRAINING PROGRAM** is required by each facility in cooperation with the Florida Phosphate Producers before the contractor employee may work in a member site.

The training process, as established by the Florida Phosphate Producers, will provide continuity to safety training for contractor employees. This training process is based on the requirements of the OSHA and complies with general safety rules used by the Florida Phosphate Producers Member facilities.

To control the consistency and quality of training, the Florida Phosphate Producers have selected the **Leary Technical Center** in Tampa and **Polk State College** in Lakeland as approved training centers. These centers are responsible for daily control of the training process and to provide documentation as requested by an individual Florida Phosphate Producers member. The Florida Phosphate Producers will periodically evaluate the training process to ensure effectiveness and usefulness of the training media.

Training programs, safety procedures and rules can only assist in worker protection, the real strength of safety performance must start with each individual. The employer must plan safety into every job, "walk the walk", and insist on worker participation. Supervisors must do their part, be observant, look for the unexpected and use all of the supervisory tools including discipline when needed. As a worker, you must choose to follow all safety rules and look for the safe way to perform your task. Remember we all pay for the cost of accidents with lost wages, loss of lifestyle, pain and suffering.

PROCESS SAFETY MANAGEMENT

1. PSM Overview.

The Process Safety Management (PSM), standard 29 CFR 1910.119 which was enacted in 1992 is intended to manage Highly Hazardous Chemicals (HHC's) to prevent or minimize the consequences of a catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.

While Florida Phosphate facilities utilize numerous safeguards, the potential of a release of highly hazardous chemicals is possible. A careless act in a chemical plant, or a natural disaster, could expose contractors and their employees to a serious hazard, injury or even death. Disasters have happened as shown below:

- 1984 --Bhopal, India 2,000 deaths from Methyl Isocyanate (MIC);
- 1989--Phillips Petroleum, Houston, Texas resulted in 24 deaths and 132 injuries;
- 1990--ARCO Channelview, Texas resulted in 17 deaths;
- 1991--IMC - Angus Sterlington, Louisiana resulted in 8 deaths and 128 injuries.

a. This standard applies to the following:
   I. A process which involves a chemical at or above the specified threshold quantities (TQ) listed in Appendix A;
   II. A process which involves a flammable liquid or gas (as defined in 29 CFR 1910.1200(c) on site in one location, in a quantity of 10,000 pounds or more except for:
      1) Hydrocarbon fuels used solely for workplace consumption as a fuel (e. g. propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard;
      2) Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

b. This standard does not apply to:
   I. Retail facilities;
   II. Oil or gas well drilling or servicing operations; or
   III. Normally unoccupied remote facilities.

c. Many of the FPP facilities must comply with the PSM regulation due to the onsite storage of Anhydrous Ammonia and Sulfur Trioxide above the TQ.
   I. The implementation of the PSM standard include areas such as the Anhydrous Ammonia Storage, Granulation and Sulfuric Acid Plants.

2. Employee Participation.

a. You must develop a written plan of action regarding the use of employees in PSM.

b. You must consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of PSM.

c. You must provide to employees and their representative access to process analyses and to all other information required to be developed under this standard.

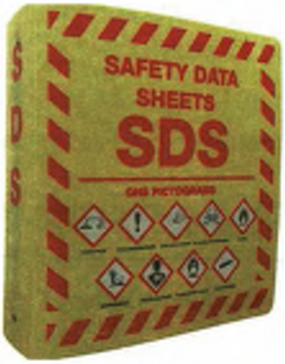
3. Process Safety Information.

a. Before conducting any process hazard analysis, you must complete a compilation of written process safety information. The compilation of written process safety information is to enable you and your employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals. The process safety information must include:

   I. Information pertaining to the hazards of the HHC used or produced by the process;
   II. Information pertaining to the technology of the process; and
   III. Information pertaining to the equipment in the process.

b. Information pertaining to the highly hazardous chemical in the process must include:

   I. Toxicity information;
   II. Permissible exposure limits (PEL);
   III. Physical data;
   IV. Reactivity data;
   V. Corrosive data;
   VI. Thermal and chemical stability data; and
   VII. Hazardous effects of inadvertent mixing of different material that could foreseeably occur.



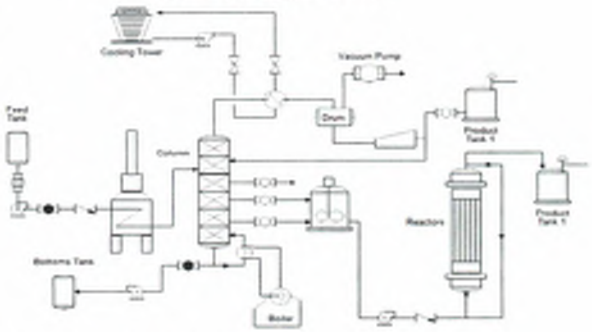
NOTE: Safety Data Sheets (SDSs) may be used to comply with this standard to the extent they contain the information required above.

c. Information pertaining to the technology of the process must include:

   I. A block flow diagram;
   II. A process flow diagram;
   III. Process chemistry;
   IV. Maximum intended inventory;
   V. Safe upper and lower limits for such items temperatures, pressures, flows or compositions; and
   VI. An evaluation of the consequences of deviations, including those affecting the safety and health of employees.
   VII. Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

A ***block flow diagram*** is a simplified diagram used to show the major process equipment and interconnecting process flow lines and flow rates, stream composition, temperatures, and pressures when necessary for clarity.

The employer may wish to use a ***process flow diagram***. Process flow diagrams are more complex and show all main flow streams, including valves, to enhance the understanding of the process.



Process Flow Diagram or PFD

d. Information pertaining to the equipment in the process must include:
   - I. Material of construction;
   - II. Piping and instrument diagrams (P&IDs);
   - III. Electrical classification;
   - IV. Relief system design and design basis;
   - V. Ventilation system design;
   - VI. Design codes and standards employed;
   - VII. Material and energy balances for processes built after May 26, 1992; and
   - VIII. Safety systems (e.g. interlocks, detection or suppression systems).

e. Document that equipment complies with recognized and generally accepted good engineering practices.

f. For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, you must determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

4. Process Hazard Analysis (PHA).

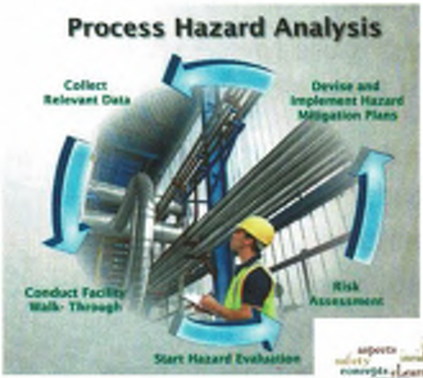
a. You must perform an initial PHA on processes covered by this standard. A PHA is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of HHC. The PHA must be re-validated every 5 years.

b. The PHA must be appropriate to the complexity of the process and must identify, evaluate, and control the hazards involved in the process. You must determine and document the priority order for conducting PHA based on a rationale, which includes such considerations as:
   - I. Extent of the process hazards;
   - II. Number of potentially affected employees;
   - III. Age of the process, and
   - IV. Operating history of the process.

c. You must conduct the PHA in a timely fashion. New or modified plants must have completed the PHA before startup. The PHA must address:
   - I. The hazards of the process;
   - II. The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;
   - III. Engineering and administrative controls applicable to the hazards and their interrelationships, such as methods of detection to provide early warning of releases;
   - IV. Consequences of the failure of engineering and administrative controls;
   - V. Facility siting;
   - VI. Human factors; and
   - VII. A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

d. One or more of the following methods, or an equivalent method, should be used in order to determine and evaluate the hazards of the process being analyzed:

  I. What-If;
  II. Checklist;
  III. What-If / Checklist;
  IV. Hazard and Operability Study (HAZOP);
  V. Failure Mode and Effect Analysis (FEMA),
  VI. Fault Tree Analysis.



5. Operating Procedures.

a. Operating procedures must describe:

  I. The tasks to be performed;
  II. Data to be recorded;
  III. Operating conditions to be maintained;
  IV. Samples to be collected; and
  V. Health precautions to be taken.

b. You must prepare written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information.

c. The procedures must be technically accurate and understandable to employees. The procedures should be reviewed by engineering staff and operating personnel to ensure their accuracy and that they provide practical instructions on how to actually carry out job duties safely.

d. These operating procedures must address at least the following elements:

  I. Steps for each operating phase:
  II. Initial startup
  III. Normal operations
  IV. Temporary operations

e. An emergency shutdown, including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner, must include:

  I. Emergency operations;
  II. Normal shutdown and startup following a turnaround, or after an emergency shutdown;
  III. Operating limits;
  IV. Consequences of deviation;
  V. Steps required to correct or avoid deviation;
  VI. Safety and health considerations;
  VII. Properties of, and hazards presented by, the chemicals used in the process;
  VIII. Precautions necessary to prevent exposure, including engineering controls, administrative controls, and Personal Protective Equipment (PPE);
  IX. Control measures to be taken if physical contact or airborne exposure occurs;
  X. Quality control for raw materials and control of hazardous chemical inventory levels; and
  XI. Any special or unique hazards.

f. Operating procedures must be readily accessible to employees who work in or maintain a process.

g. Operating procedures must be reviewed to assure they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. You must certify annually that these operating procedures are current and accurate.

h. Safe work practices for the control of hazards during operations must be documented such as:

  I. Lockout/tagout;
  II. Confined space entry;
  III. Opening process equipment or piping; and
  IV. Control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel.
  V. These safe work practices must apply to employees and contractor employees.

6. Training.

a. Initial Training for Each Worker.

  I. Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, must be trained in an overview of the process and in the operating procedures. The training must include:

    1) Emphasis on the specific safety and health hazards;
    2) Emergency operations including shutdown; and
    3) Safe work practices applicable to the employee's job tasks.

b. Refresher Training.

  I. Refresher training must be provided at least every three (3) years, more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. Leadership must, in consultation with the employees involved in operating the process, determine the appropriate frequency of refresher training.

c. Training Certification.

  I. Leadership must ascertain that each employee involved in operating a process has received and understood the required training, In addition, a record must be prepared and maintained which contains the identity of the employee, the date of training and the means used to verify that the employee understood the training.

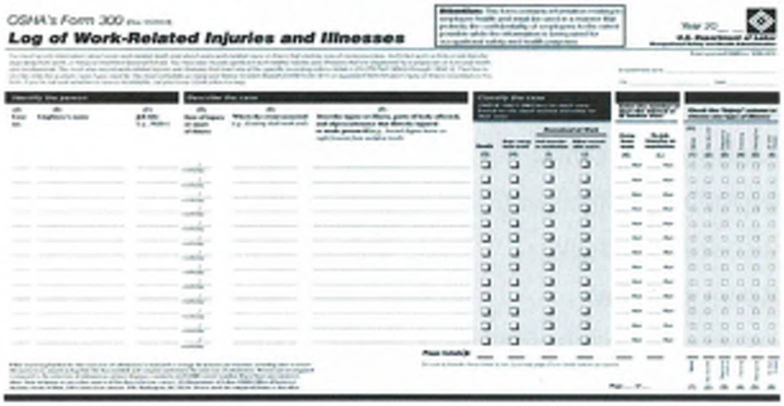
7. Contractors.

a. This standard applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

b. PSM Facility Responsibilities with Regard to Contractors:

  I. When selecting a contractor, obtain and evaluate information regarding the contract employer's safety performance and programs; such as

    1) OSHA Form 300, Illness & Injury Form for the last three (3) years;



OSHA's Form 300

Log of Work-Related Injuries and Illnesses

Year 20__

2) Experience Modification Rate (or Form) for the last three (3) years; and
3) Written health and safety programs.

- II. Inform contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process;
- III. Explain to contract employers the applicable provisions of the Emergency Action Plan;
- IV. Develop and implement safe work practices to control the entrance, presence and exit of contract employers and contract employees in covered process areas;
- V. Periodically evaluate the performance of contract employees in fulfilling their obligations; and
- VI. Maintain a contact employee injury and illness log related to the contractor's work in process areas.

c. Contract Employer Responsibilities:

- I. The contract employer must assure that each contract employee is trained in the work practices necessary to safely perform his/her job;
- II. The contract employer must assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process;
- III. The employee must also be aware of the applicable provisions of the emergency action plan;
- IV. Annually attend contract employers Site-Specific Safety Training course;
- V. The contract employer must document that each contract employee has received and understood the required training;
- VI. The contract employer must assure that each contract employee follows the safety rules of the facility including required safe work practices; and
- VII. The contact employer must advise employees of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

8. Pre-Startup Safety Review.

a. You must perform a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.

b. The pre-startup safety review must confirm that prior to the introduction of highly hazardous chemicals to a process, the following are true:

- I. Construction and equipment is in accord with design specifications;
- II. Safety, operating, maintenance, and emergency procedures are in place and are adequate;
- III. For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup;
- IV. Modified facilities meet the requirements contained in Management of Change (Page 12); and
- V. Training of each employee involved in operating a process has been completed.

9. Mechanical Integrity.

a. Mechanical Integrity relates to the proper function of all parts associated with a particular process or processes. This section applies to the following process equipment:

- I. Pressure vessels and storage tanks;
- II. Piping systems (including piping components such as valves);
- III. Relief and vent systems and devices;
- IV. Emergency shutdown systems;
- V. Controls (including monitoring devices and sensors, alarms, and interlocks); and
- VI. Pumps.

b. You must establish and implement written procedures to maintain the on-going integrity of process equipment. As such, it is vital to have established procedures in regard to:
   - I. Training;
     - 1) You must train each employee involved in maintaining the on-going integrity of process equipment. The employee must be given an overview of that process and its hazards and in the procedures applicable to the employee's job tasks. The purpose of this training is to assure that the employee can perform the job tasks in a safe manner.
   - II. Inspections and Tests;
     - 1) Inspections and tests must be performed on process equipment. Inspection and testing procedures must follow recognized and generally accepted good engineering practices. The frequency must be consistent with applicable manufacturers' recommendations and good engineering practices.
   - III. Documentation;
     - 1) You must document each inspection and test that has been performed on process equipment. The documentation must include:
     - 2) The date of the inspection or test, the name of the person who performed the inspection or test,
     - 3) The serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and
     - 4) The results of the inspection or test.
   - IV. Correct Deficiencies;
     - 1) Correct deficiencies in equipment that are outside acceptable limits before further use.
   - V. Quality Assurance;
     - 1) In the construction of new plants and equipment, you must assure that equipment as fabricated is suitable for its intended purpose,
     - 2) Appropriate checks and inspections must be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions, and
     - 3) You must assure that maintenance material, spare parts and equipment are suitable for the process application for which they will be used.

10. Hot Work Permit.

a. Hot work relates to any efforts made with flame or heat-producing tools, such as grinders, welding and cutting equipment, or any device that involves combustive heat or open flames. You must receive a hot work permit for hot work operations conducted on or near a covered process. ***A permit is required before any hot work can be performed***. The permit must:
   - I. Document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations;
   - II. Indicate the date(s) authorized for hot work;
   - III. Identify the object on which hot work is to be performed; and
   - IV. The permit must be kept on file until completion of the hot work operation.

11. Management Of Change.

a. You must establish and implement written procedures to manage changes (except for, "replacements in kind") to process chemicals, technology, equipment, and procedures; you must also establish and implement written procedures to manage changes to facilities that affect a covered process.

b. The procedures must assure that the following considerations are addressed prior to any change:

   I. The technical basis for the proposed change;
   II. Impact of change on safety and health;
   III. Modifications to operating procedures;
   IV. Necessary time period for the change; and
   V. Authorization requirements for the proposed change.

c. Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process must be informed of, and trained in, the change prior to the start-up of the process or affected part of the process.

d. Management of change actions must be coordinated with current operating procedures. If process is shut down to make a change, the procedures must be updated before re-starting the process.

12. Incident Investigation.

a. You must investigate each incident, which resulted in or could reasonably have resulted in a catastrophic release of HHC in the workplace. An incident investigation must be initiated as promptly as possible, but ***not later than 48 hours following the incident***.

b. An incident investigation team must be established and consist of a least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to investigate the incident.

c. A report must be prepared at the conclusion of the investigation which includes at a minimum:

   I. Date of incident, Date investigation began, Description of the incident, Factors that contributed to the incident and any recommendations resulting from the investigation.

d. A system to promptly address and resolve findings and recommendations must be established.

e. Resolutions and corrective actions must be documented.

f. The report must be reviewed with all affected personnel whose job tasks are relevant to the incident.

g. Incident investigation reports must be retained for five (5) years.

13. Emergency Planning and Response.

a. The employer must establish and implement an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38(a).

b. The Emergency Action Plan must include procedures for handling large and small releases.

14. Compliance Audits.

Evaluate compliance at least every 3 years to verify that the procedures and practices developed are adequate and are being followed. Retain the two most recent compliance audit reports.

15. Trade Secrets.

All necessary information must be made available to those responsible for compiling the process safety information, development of the process hazards analysis, for developing operating procedures, and those involved in incident investigations, emergency planning and compliance audits. This must be done without regard to the possible trade secret status of such information.

PSM REVIEW

1. Contractors working in or around a PSM covered process are required to have been informed of the PSM regulation as it applies to their work?

   A. True

   B. False

2. Employers are required to provide what to employees working in or around a PSM covered process?

   A. Unsafe working conditions

   B. Financial planning services

   C. Training on how to safely perform their job

   D. A one hour lunch break

   E. Medical Insurance

3. Complete this sentence. The PSM standard is intended to manage ______________________________ ____.

4. What are the characteristics of the chemicals that could cause a catastrophic release?

   A. ______________________________

   B. ______________________________

   C. ______________________________

   D. ______________________________

5. What two chemicals in the Phosphate Industry require the facility to comply with the PSM standard?

   A. ______________________________

   B. ______________________________

6. Management of Change (MOC) procedures are required for any PSM covered process when?

   A. Change (not in kind) is made to process equipment

   B. Change is made to process equipment using the same exact parts

   C. New employee is hired

   D. Each time the process is started

   E. Management personnel changes positions

JOB SAFETY REVIEW

1. Introduction.

a. The purpose of conducting a job safety review is to aid in preventing health and safety incidents from occurring. This is accomplished by identifying potential hazards associated with job and implementing controls prior to work starting.

b. There are various terminologies used to describe the job safety review process.

   I. Job Safety Review
   II. Job Hazard Analysis
   III. Pre-Job Risk Assessment

c. Whichever process is used, it should meet the facilities minimum requirements. If a contractor does not have its own job safety review program, they must use the facilities program.

d. Many facilities require the job safety review for any task being performed while other facilities require the job safety review for task that only require a permit such as lockout, hot work, line opening, crane lift, electrical work, water safety, confined space, excavation, etc.

e. The job safety review must be conducted before a new job begins and at the beginning of each shift.

2. Responsibilities.

a. A trained person designated by the employer shall perform the job safety review.

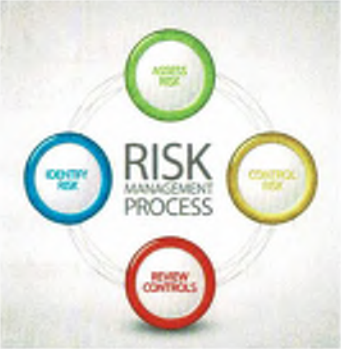
b. Contractors are responsible for ensuring the job safety review is performed by trained individuals.

c. Persons conducting the job safety review shall be able to recognize hazards and adverse conditions that are present in a work area or that are predictable to someone familiar within the facility.

d. A best practice is for supervisors or a foreman to conduct the examination, but an experienced non-supervisory employee also may be a designated person.

e. Some facilities not only require a trained person to conduct the job safety review, but that everyone involved in the job must be part of the job safety review.

3. Work Place and Hazard Correction.



a. It is important to point out that a job safety review is not just a review of the task, but also the work place where the task is performed.

b. A work place is defined as any place in or about the facility where work is being performed. This includes areas where work is performed infrequently such as maintenance or clean-up.

c. The ultimate purpose of this rule is to identify hazards and promptly correct any hazards found.

d. Examples of hazards include: Chemical, Biological, Ergonomic, Thermal, Machinery, Weather, Electrical, Falling Objects, Falls, Noise, Struck By, Fire, Drowning, Heat Stress, Radiation, etc.

e. No job should be started until all hazards have been adequately controlled. Hazards that are not able to be controlled must be brought to the attention of the facility representative.

4. Documentation.

a. A record of the job safety review must be used. The record must include: date, examiner name, area being examined, job task, description of any hazards and controls used to mitigate the hazards.

JOB SAFETY REVIEW

1. When a job safety review is required it must be conducted before the task begins and at the beginning of each shift?

   [✓ A. True]
   B. False

2. The purpose of a Job Safety Review is to?

   A. Evaluate past accidents and near misses.
   B. Inspect for potential process design flaws.
   C. Determine if employees work safely.
   [✓ D. Aid in preventing health and safety incidents from occurring by identifying potential hazards associated with the job.]

3. Complete this sentence. Only ____________________ employees designated by the employer should conduct the Job Safety Review.

4. At a minimum, most facilities require a Job Safety Review performed if the task requires what?

   A. ___________________________________

5. The ultimate purpose of the Job Safety Review is to?

   A. ____
   B. ____

6. Hazards that must be evaluated include which of the following? (Circle all that is correct)

   [✓ A. Falls of persons]
   B. Wearing PPE
   [✓ C. Rotating parts or pinch points]
   D. Lockout Tagout
   [✓ E. Strains or pulled muscles]

TOC

ACCIDENTS

1. Introduction.

a. According to Webster's Dictionary accidents are unexpected or unintentional occurrences, which may have undesirable results. As employers and employees we are required to report all accidents in a prompt and accurate manner. Accidents include injuries, near misses, chemical spill or releases, property damage and fires.

b. The majority of accidents are caused by human error or unsafe acts. Failure to follow procedures, taking short cuts, rushing, not being focused on the task and poor pre-job planning are just some of the leading causes of accidents.

2. Injuries

a. All injuries must be reported immediately to the facility representative regardless of severity.

b. Examples include: First degree burns, cuts, pulled muscle, ankle strain, insect bites or stings, trouble breathing, particle in eye requiring flushing, etc.

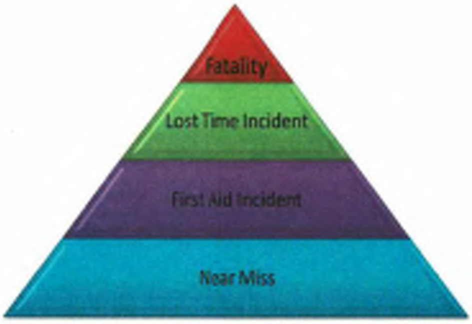
c. The following conditions should be considered:

- I. All injuries must receive prompt/proper medical care.
    - 1) Proper medical care can prevent injuries from worsening, swelling, infection, etc.
    - 2) Follow-up treatments may be required, possibly by a medical specialist.
    - 3) Medical surveillance may be required for some exposures.
- II. The employer's medical provider must be consulted for treatment.
- III. Injuries must be reported to your supervisor for proper documentation.
- IV. Florida's Workers Compensation Laws require the employee to report accidents promptly to their employer.
- V. OSHA requires that certain injuries and illnesses be recorded on the OSHA 300 Log.
- VI. All injuries are to be seen by FPP onsite nurse or a member of the ERT before getting off-site treatment. This will save time, money and reduce the likelihood of a recordable incident.

3. Near Miss

a. OSHA defines a "near miss" as an incident where no property damage occurred and where no personal injury was sustained, but given a slight shift in time or position, damage and/or injury easily could have occurred. The reporting of a near miss is critical in accident prevention. Often times a near miss report will allow us to look at an incident and find corrective actions without someone suffering an injury. Examples of a near miss follows:

- I. A falling object such as tools, materials or debris.
- II. Close calls with automobiles or mobile equipment.
- III. Rigging slipping during a lift.
- IV. A crane getting "light" during a lift.
- V. An improper lockout/ tagout.
- VI. Chemical spill or spray that could have endangered a worker.
- VII. Slipping on a wet surface.



b. Report all Near Misses so that each incident can be used to prevent injuries or severe accidents.

4. Chemical Spills or Releases

a. Great care should be used in handling all chemicals; spill prevention and containment of spilled material should be covered by your employer prior to starting work. Any time a chemical is spilled or released you are required to report this to the host site. The host site will make determinations as to the extent of the cleanup operations.

   I. Certain chemicals require specialized PPE, equipment or media for cleaning operations.
   II. Disposal of these materials may require special treatment.
   III. There are chemicals that require prompt reporting to a State or Federal Agency if spilled in certain quantities.
   IV. The area of the spill may have to be barricaded off to prevent persons from coming into contact with the spilled material.
   V. An emergency response may be required; the host site must be notified immediately.

5. Property Damage

a. All damage to property must be reported as soon as it occurs. Damage to plant equipment may pose a hazard to all workers.

   I. Damage to process equipment may allow a chemical release.
   II. Prompt reporting may lessen downtime for process equipment repairs.
   III. Some damaged process equipment may not show damage until it is pressurized.
   IV. Damage to equipment such as a Bridge Crane may not show up for several weeks until eventually the crane fails.
   V. Damage to contractor equipment or your personal equipment must be reported immediately for consideration of repairs.

6. At Risk Behavior

a. An at-risk behavior is taking a chance or ignoring an established safety policy or procedure. In order to reduce injuries and pain and suffering, we must all increase our safety awareness and eliminate at-risk behaviors. Examples are:

   I. Not wearing correct PPE such as gloves or safety glasses with side shields.
   II. Not using correct lifting techniques.
   III. Not keeping our "eyes on path" when walking.
   IV. Not following established safety procedures.
   V. Not using a handrail when ascending or descending stairs and ladders.
   VI. Not keeping our "mind on work" when performing tasks.
   VII. Taking shortcuts to get the job done faster.
   VIII. Horseplay

b. The easiest route isn't always the safest.

   I. The extra time and effort spent to ensure your safety and the safety of those working with you is always worth it.

7. Unsafe Conditions

a. A condition in the work place that is likely to cause property damage or injury. We are surrounded by hazards that could cause harm every day.

b. Unsafe conditions involve the general work environment, process equipment, hazardous tools and more:

   I. Lack of adequate guards or safety devices
   II. Damaged or missing guardrails or grating
   III. Exposed electrical wires
   IV. Poor ventilation
   V. Protruding objects
   VI. Lack of signage
   VII. Poor housekeeping, slip trip hazards across walking working surface
   VIII. Inadequate illumination or intense noise
   IX. Defective tools and equipment
   X. Damage to process equipment may allow a chemical release.

8. Emergency Preparedness

a. Emergencies can create a variety of hazards for workers in the impacted area. Preparing before an emergency incident plays a vital role in ensuring that employers and workers have the necessary equipment, know where to go, and know how to keep themselves safe when an emergency occurs. The employer must:

   I. Provide employees with a listing of emergency telephone numbers and radio channels for notifying the host site of an emergency.
   II. Provide training for each employee on proper reporting procedures.
   III. Maintain a list of all employees located on the site.
   IV. Each employee must understand the specific emergency and evacuation procedures for the site where they are working.

ACCIDENTS REVIEW

1. All accidents except for fires that were put out quickly must be reported immediately to the facility?

   A. True

   B. False

2. When someone is injured, what must be considered?

   A. Receiving the proper medical treatment

   B. Informing your employer so proper documentation can be recorded

   C. Some injuries may need to be recorded on the OSHA 300 log

   D. All the above answers are correct.

3. Complete this sentence. Some chemical spills may require prompt reporting to

   ______________________________.

4. An incident where no property damage occurred and where no personal injury was sustained, but given a slight shift in time or position, damage and/or injury easily could have occurred is known as what?

   A. ______________________________

5. The benefit of reporting near misses is to help prevent an accident from occurring?

   A. True

   B. False

6. In case of an emergency, employees should receive what? (Circle all that is correct)

   A. Facility contact information

   B. Information on reporting requirements

   C. A whistle

   D. Flu shot

   E. Information on evacuation and shelter-in-place locations

TOC

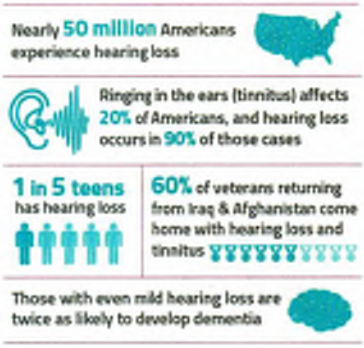
HEARING CONSERVATION

1. Introduction.

a) Hearing loss is one of the most common occupational health concerns in the workplace. The OSHA 29 CFR 1910 Part 95 standard is intended to prevent the occurrence and reduce the progression of occupational noise-induced hearing loss among workers.

b) Hearing loss reduces your ability to hear sound, but it can also pose the following effects:

- I. Impairs your ability to communicate.
- II. Causes fatigue and irritability.
- III. Depression
- IV. Failure to hear warning signals.
- V. Reduces your ability to learn new task.
- VI. Can contribute to Tinnitus (ringing in ear)


Nearly 50 million Americans experience hearing loss
Ringing in the ears (tinnitus) affects 20% of Americans, and hearing loss occurs in 90% of those cases
1 in 5 teens has hearing loss
60% of veterans returning from Iraq & Afghanistan come home with hearing loss and tinnitus
Those with even mild hearing loss are twice as likely to develop dementia

c) Sound consists of pressure changes caused by vibration or turbulence. These pressure changes produce waves. Our ears transfer this pressure into a nerve impulse so that our brain can detect the noise.

d) Exposure to high noise levels over extended periods is the most common cause of hearing loss.

e) Exposure to very high noise levels over a short duration of time can also cause hearing loss.

f) Hearing damage depends primarily on the intensity of the noise and the duration of the exposure.

2. Hearing Loss.

a) Hearing loss occurs when the cilia (hair cells) of the inner ear are damaged by overexposure.

b) This damage can happen more significantly in older workers.

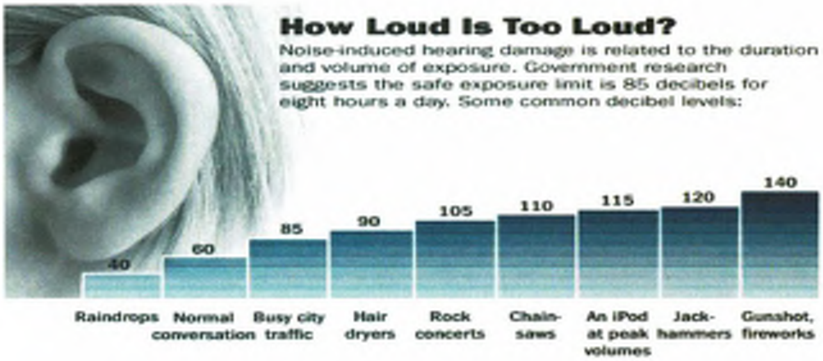
c) Temporary Threshold Shifts (TTS) will occur when your ears are exposed to loud noise. Generally, after a period of rest, the hair cells recover. Unfortunately, a little bit of your hearing never comes back each time this happens and eventually you have a noticeable hearing loss.

d) Prolonged exposure to high noise levels over a period of time gradually causes permanent damage. This is known as Permanent Threshold Shifts (PTS). This hearing loss can never be reversed.

3. Decibel.

a) A decibel (dBA) is a unit of measure for noise.

b) A small change in the decibel scale relates to a large change in the level of sound pressure waves. For example, a decibel reading of 90 is 10 times more intense than a reading of 80.



4. Noise Exposure Assessment.

a) OSHA states that any noise level above a TWA8 of 85dBA, the potential for hearing loss is possible.

b) Employers must establish a system of monitoring that evaluates employee's noise exposure to determine if their exposure is above the TWA8 of 85dBA.

c) Noise monitoring is generally conducted by using a noise dosimeter. The employee must be notified of their exposure if determined to equal or exceed the TWA8 of 85dBA.

d) If employee's noise exposure equals or exceeds the TWA8 of 85dBA, the employer must enroll the employee in a written hearing conservation program.

5. Engineering and Administrative Controls.

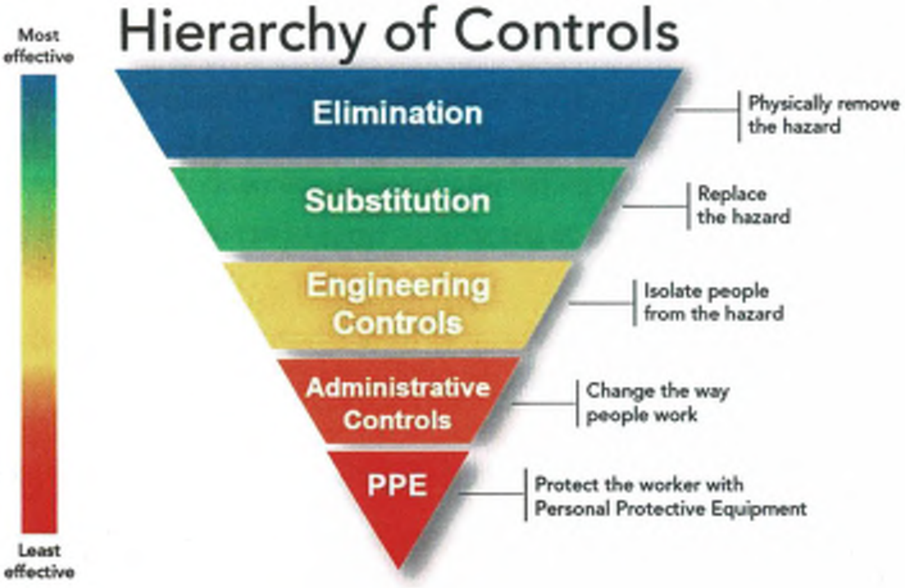
a) OSHA feels that any noise level above a TWA8 of 90dBA requires that engineering controls should be the primary method to reduce the sound level the employee is being exposed to.

b) Examples of engineering controls would be: Sound curtain or barrier, muffler, rubber footing, etc.

c) If engineering controls are not feasible, administrative controls should then be implemented to reduce the time the employee is exposed. Until such controls are implemented or if the controls are not feasible, hearing protection devices must be provided.

d) Examples of administrative controls would be:

   I. Operating noisy machines during shifts when fewer people are exposed.
   II. Limiting the amount of time a person spends at a noise source (rotating workers).
   III. Providing quiet areas where workers can gain relief from hazardous noise sources.
   IV. Restricting worker presence to a suitable distance away from noisy equipment.


Hierarchy of Controls
Most effective
Least effective
Elimination
Physically remove the hazard
Substitution
Replace the hazard
Engineering Controls
Isolate people from the hazard
Administrative Controls
Change the way people work
PPE
Protect the worker with Personal Protective Equipment

TOC

6. Administrative Controls Table.

dBA	T (hours)
80	32.0
85	16.0
86	13.9
87	12.1
88	10.6
89	9.2
90	8.0
91	7.0
92	6.1
93	5.3
94	4.6
95	4.0
96	3.5
97	3.0
98	2.6
99	2.3

dBA	T (hours)
100	2.0
101	1.7
102	1.5
103	1.3
104	1.1
105	1.0
106	0.87
107	0.76
108	0.66
109	0.57
110	0.50
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25

Note: NIOSH uses a more stringent administrative control table than OSHA.

7. Hearing Protectors.

a) OSHA requires hearing protection worn when engineering controls are not feasible to reduce noise levels or when noise levels are above the dBA for the duration noted in the above table.

b) It is important to note that the phosphate industry requires hearing protection worn for any time above 85 decibels no matter the length of exposure time.

c) Most FPP facilities require dual hearing protection when exposure levels exceed 105 dBA.

d) Some FPP facilities require no employee's exposure is allowed to exceed 115 dBA, as determined without the adjustment for the use of any hearing protector.

e) The OSHA limit for impulsive or impact noise is 140 dB peak. This limit is independent of the duration of the noise impulse. There is no OSHA limit for number of exposures to impact noise. Impulsive or impact noise must be integrated into the measurement of continuous noise exposure.

f) The employer must train the employee on the various types of hearing protectors and the care, fitting and use of each type.

g) Ear muffs, ear plugs, ear bands and custom plugs all have advantages and disadvantages.

h) Keeping hearing protection clean and having them fit properly tend to be the most common issues that employees face.

i) Noise Reduction Ratings (NRR) that are listed on the package should not be used solely as they are described. These numbers were determined by using perfect laboratory conditions. OSHA and NIOSH have formulas that should be used to determine a more accurate reduction.

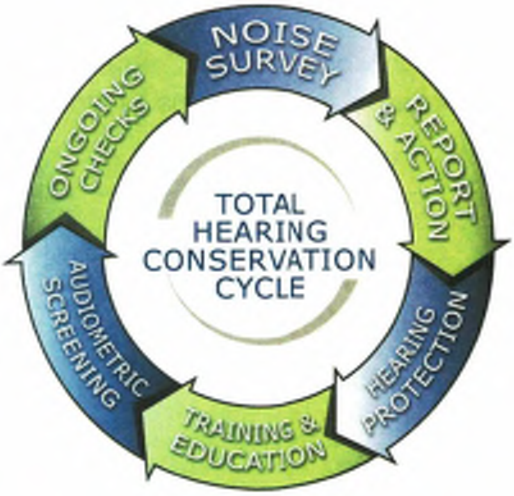
j) Use the following formulas to estimate the attenuation afforded in a work environment by muffs, plugs, or a combination of both.

  I. For single hearing protection, subtract a 7 dB correction factor from the NRR, as follows:
    1) Estimated Exposure (dBA) = TWA (dBA) - (NRR - 7)
    2) Example: Noise exposure is TWA=100 dBA and the muff NRR=19 dB
    3) Estimated Exposure = 100 - (19-7) = 88 dBA
  II. For dual protection (ear muffs and plugs are used simultaneously) use the following:
    1) Determine the NRR for the higher rated protector
    2) Subtract 7 dB from NRR.
    3) Add 5 dB to the field-adjusted NRR to account for the use of the second hearing protector.
  III. To adjust for workplace conditions, OSHA strongly recommends applying a 50% correction factor when estimating field attenuation. This means after subtracting 7 from the NRR, divide by 2.

8. Hearing Conservation Program.

a) As noted earlier, if employee's noise exposure equals or exceeds the TWA8 of 85dBA, the employer must enroll the employee in a written hearing conservation program. A hearing conservation program consist of the following:

  I. Monitoring of work place for noise levels.
  II. Employee notification of monitoring results.
  III. Annual audiometric testing.
  IV. Proper selection of hearing protection.
  V. Annual training.
  VI. Posting of the hearing conservation regulation.



HEARING CONSERVATION REVIEW

1. Which of the following effects can occur due to hearing loss.
   - A. Impairs your ability to communicate
   - B. Causes fatigue, irritability and depression
   - C. Failure to hear warning signals
   - D. Can contribute to Tinnitus (ringing in ear)
   - E. All the above answers are correct

2. Hearing loss occurs when the cilia in the inner ear are damaged. This damage can happen more significantly in younger or older workers?
   - A. Younger
   - B. Older
   - C. Both the same

3. Complete this sentence. If employee's noise exposure equals or exceeds the TWA8 of 85dBA, the employer must enroll the employee in a ____.

4. List the types of controls that OSHA requires to reduce the sound level the employee is exposed to, in the order they should be implemented?
   - A. 1) ________________________________
   - B. 2) ________________________________
   - C. 3) ________________________________

5. The phosphate industry requires hearing protection worn when employee exposure is above 85 decibels if the duration is 8 hours or longer?
   - A. True
   - B. False

6. Double hearing protection is required when exposure level is at or above?
   - A. 85 dBA
   - B. 90 dBA
   - C. 105 dBA
   - D. 115 dBA

7. Complete this sentence. Keeping hearing protection ______________ and having them ____________________________ tend to be the most common issues that employees face.

TOC

RESPIRATORY PROTECTION

1. Respiratory Protection Program.

In order to wear a respirator you must be included in a respiratory protection program through your employer, which includes:

a) Medical evaluation.

b) Fit testing for the particular respirator being used.

c) A respirator fit test shall be carried out for each wearer of a tight-fitting respirator at least once every 12 months.

d) Training on the use and care of the respirator.

e) Respirators shall be provided by the employer when such equipment is necessary to protect the employee.

2. Engineering/Administrative Controls.

a) Engineering controls include changing the process in some way to eliminate the need for respiratory protection such as a ventilation, dust suppressant system, etc.

b) Administrative controls include scheduling of work in order to reduce or eliminate exposures by reducing the exposure time.

   I. Rotation of jobs

   II. Limited times at certain tasks

3. Major Types of Respirators.

There are two major types of respirators including air-purifying respirators and atmosphere-supplying respirators.

a) Air-filtering/purifying respirators filter contaminated air that contains enough oxygen to sustain life.

   I. Air Filtering for dust/mist/fumes.

   II. Air Purifying for vapors/gasses.

b) Atmosphere-supplying respirators supply breathable air from an uncontaminated source.

4. Limitations of Air-Purifying Respirators.

a) Must have sufficient oxygen (greater than 19.5%).

b) Must have air-purifying device suitable for the contaminant.

   III. Correct type of cartridges

   IV. Particulate filters

   V. Multi-chemical cartridges don't last as long as single chemical cartridges.

   VI. Good only for atmospheres that are within the maximum use concentration.

   VII. If the contaminant is a gas or vapor and has poor warning properties, the use of an atmosphere-supplying respirator is generally recommended.

TOC

c) Air-purifying respirator shall have either:
   - I. A reliable end-of-service-life indicator that will warn the user prior to contaminant breakthrough or
   - II. A cartridge change schedule is implemented based on cartridge service data including desorption studies (unless cartridges are changed daily), expected concentration, pattern of use, and duration of exposure have been established, and the chemical does not have a ceiling limit.

5. Limitations of Air-Supplying Respirators.

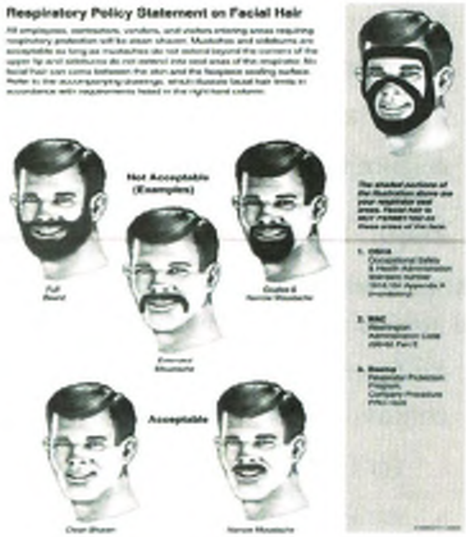
a) Limited air supply if self-contained.

b) Bulky and puts extra strain on worker.

c) More involved training in order to use them properly.

6. Facial Hair.

A respirator, either positive or negative pressure, equipped with a facepiece (tight or loose fitting) shall not be worn if facial hair comes between the sealing surface of the face piece and the face or if facial hair interferes with valve function.


Respiratory Policy Statement on Facial Hair
Not Acceptable (Examples)
Acceptable

7. Inspections.

a) Respirators must be inspected before each use to assure proper operation before entering a hazardous atmosphere. Inspection to include the following:
   - I. Straps.
   - II. Face piece.
   - III. Exhalation valves.
   - IV. Inhalation valves.
   - V. Filters.

8. Storage and Cleaning of Respirators.

a) Particulate filters are usually one use and disposable.

b) Respirators must be kept in a clean, dry condition and protected from damage.
   - I. Stored in a plastic bag, nothing stored on top of respirator
   - II. Not stored in the sunshine, UV light can damage components
   - III. Respirators shall be cleaned after each use in accordance with manufacturer's recommendations.
     - 1) Usually cleaned with a mild soap and water solution with an added disinfectant
     - 2) Allowed to air dry or dried with a soft cloth

9. Training Frequency.

Each respirator wearer shall be trained upon initial assignment and be retrained once every 12 months.

10. Compressors Used To Supply Air.

a) Compressors are used to supply breathing air for sandblasting, tank entry, sulfur dioxide leak repairs, etc. at our facilities. Several precautions can assure that breathing air supplied by these compressors is of sufficient quality.

b) Compressors should be tested to assure that the air supplied is at least "Grade D" quality.

c) A filter must be used with the compressor to assure air quality; it must have a tag with the most recent change date and the signature of the person authorized to perform the change.

d) Some means must be supplied to assure that carbon monoxide levels do not exceed 10ppm. This is accomplished most often by having a calibrated, continuous CO monitor in line.

e) Intakes for the compressor must be located to assure that no combustion exhausts or other contaminants can enter the system.

11. Escape-Only Respirators.

a) Where escape-only respirators are provided because of the potential for an emergency, personnel assigned to the area shall be trained in their use.

b) Personnel not assigned to the work area and visitors shall be briefed in the use of these respirators. Other requirements such as medical approval for use and detailed training are not required for these people.

c) Many facilities are requiring employees and contractors to purchase their own emergency respirators. For example:

   I. Phosphate concentrates require ammonia escape respirators when working in Dry Product granulation units (PMAP, GMAP, DAP and MicroEssentials).
   II. Some facilities require acid gas escape respirators.
   III. Some may require a half mask or full face respirator be used instead of a mouth piece type escape respirator.
   IV. A 5 or 10 minute supplied air escape respirator may be required at some marine terminal facilities or when working at elevated locations or in aerial lifts.
   V. Only a few manufacturers make an air purified escape respirator that provides protection from multiple gases or vapors. Those that do are very expensive and have limited life expectancy.

RESPIRATORY PROTECTION REVIEW

1. In order to wear an air purified or air supplied respirator, your employer must have a Respiratory Protection Program that includes:

   A. ______________________________

   B. ______________________________

   C. ______________________________

2. Air purified respirators will protect the user from any atmospheric hazard they may encounter?

   A. True

   B. False

3. Complete this sentence. A respirator, equipped with a facepiece shall not be worn if ____________________ comes between the sealing surface of the face piece and the face.

4. When must respirators be inspected?

   A. Never

   B. Always

   C. Before each use

   D. At the end of the shift

5. Other than disposable type, when should respirators be cleaned?

   A. ____

6. Respirator users must be trained? (circle all that are correct)

   A. Initially

   B. Annually

   C. When provided a new type of respirator

   D. Training is not required for disposable type air filtering respirators

7. Many of the FPP facilities require the contractor to provide their employees with the appropriate emergency escape respiratory device.

   A. True

   B. False

HEAT STRESS ILLNESS

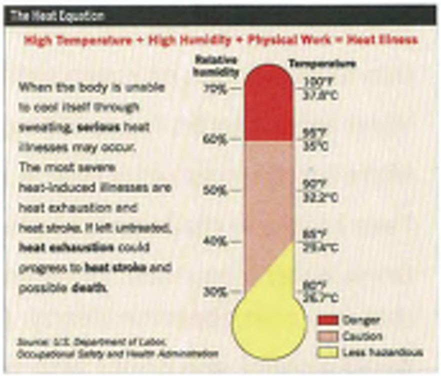
1. How The Body Cools Itself.

a) The body cools itself by increasing blood flow to the surface of the skin.

b) The sweat glands release fluid to the skin's surface.

c) As the fluid evaporates, the heat is dissipated away from the skin.

d) High humidity reduces the body's ability to cool itself.


The Heat Equation

High Temperature + High Humidity + Physical Work = Heat Illness

When the body is unable to cool itself through sweating, **serious** heat illnesses may occur. The most severe heat-induced illnesses are heat exhaustion and heat stroke. If left untreated, **heat exhaustion** could progress to **heat stroke** and possible **death**.

Source: U.S. Department of Labor, Occupational Safety and Health Administration

2. Factors That Increase Your Risk.

a) Temperature;

b) High humidity;

c) Working in direct sunlight;

d) Is the worker acclimated to the heat;

e) Intense work load;

f) Heavy clothing or PPE worn;

g) Working near high temperature equipment;

h) Personal health;

i) Medications;

j) Drugs and alcohol;

3. Heat Stress Illnesses.

a) The symptoms of heat rash include itching skin and reduced sweating.

b) Treatment for heat rash is to keep the skin dry and reduce heat exposure.

HEAT CRAMPS	HEAT EXHAUSTION	HEAT STROKE
- Painful muscle cramps - Heavy sweating	- **Pale, clammy skin, chills** - Heavy sweating - fainting - Dark urine - Nausea - Stomach cramps - Dizziness, weakness, fatigue - Headache	- **Hot, dry, red skin** - Confused, irritable - Throbbing headache - Confused - Slurred speech - Seizures - Unconsciousness - Body temperature above 104
	TREATMENT	
- Move to a cool location - Drink clear juice or sport beverage, along with water - Stretching, icing, and massaging after cramps have subsided - Wait several hours before returning to work	- Move to a cool location - If dizzy, lay down & elevate legs - Remove sweaty clothing - Apply cold packs, wet towels, take cool shower - Drink water - Monitor for change in condition - Seek medical attention	- CALL 911 - Move to a cool location - Lay victim down - Remove excess clothing - Apply cool water, cool wet towels, fanning with cool mist, apply cold packs - Give water if alert enough to drink

c) Heat stroke is very serious and can be fatal.

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4. What Can Be Done To Prevent Heat Stress Illnesses?

a) Supervisors and Foreman should use the Heat Index Table to determine what precautions should be implemented to prevent heat stress illnesses.

b) Acclimate workers by gradually increasing workloads and allow more frequent breaks for new workers or workers who have been away for a week or more from the heat

c) Schedule maintenance and repair jobs in hot areas for cooler months.

d) Schedule hot jobs for the cooler part of the day.

e) Use relief workers or assign extra workers for physically demanding jobs.

f) Wear light-colored, loose-fitting, breathable clothing such as cotton.

g) More breaks in extreme heat & humidity.

h) Take breaks in shade or cool area.

i) Drink water frequently. Drink enough water that you never become thirsty. Approximately 1 cup every 15-20 minutes.

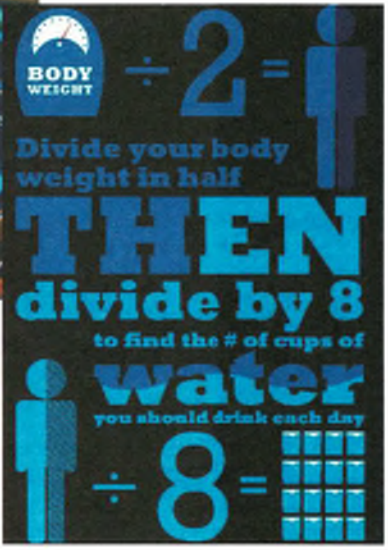
j) Avoid alcohol, and drinks with large amounts of caffeine or sugar.

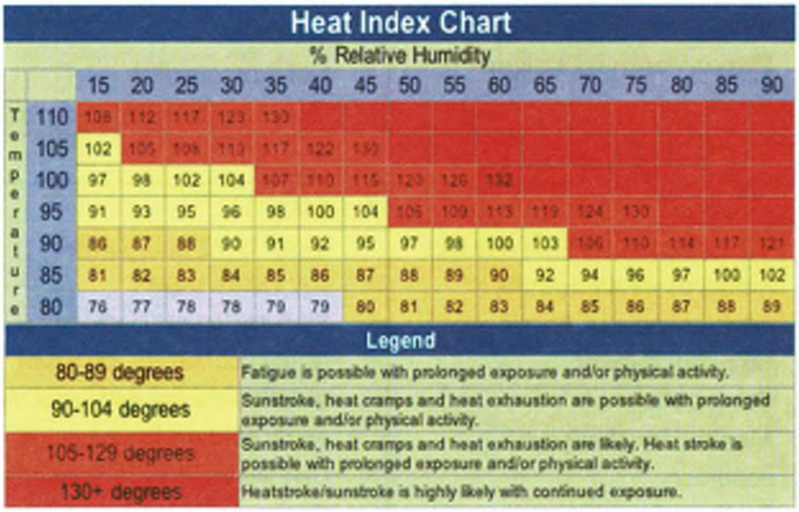
k) Wear cooling PPE such as bandanas, hat liners, cooling towels or cooling vest.

l) Ventilation fans that remove hot air, portable air conditioning equipment, vortex coolers on air supplied respirators.

WATER. REST. SHADE.

The work can't get done without them


BODY WEIGHT
÷2=
Divide your body weight in half
THEN
divide by 8
to find the # of cups of
water
you should drink each day
÷8=



Heat Index Chart

% Relative Humidity

Temperature	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
110	108	112	117	123	130											
105	102	105	108	110	117	122	130									
100	97	98	102	104	107	110	115	120	126	132						
95	91	93	95	96	98	100	104	106	109	113	119	124	130			
90	86	87	88	90	91	92	95	97	98	100	103	106	110	114	117	121
85	81	82	83	84	85	86	87	88	89	90	92	94	96	97	100	102
80	76	77	78	78	79	79	80	81	82	83	84	85	86	87	88	89

Legend

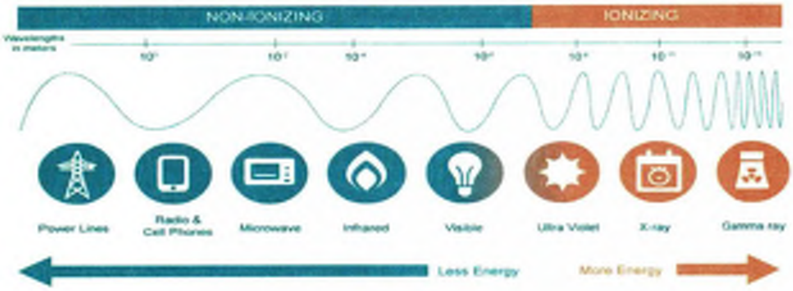
80-89 degrees	Fatigue is possible with prolonged exposure and/or physical activity.
90-104 degrees	Sunstroke, heat cramps and heat exhaustion are possible with prolonged exposure and/or physical activity.
105-129 degrees	Sunstroke, heat cramps and heat exhaustion are likely. Heat stroke is possible with prolonged exposure and/or physical activity.
130+ degrees	Heatstroke/sunstroke is highly likely with continued exposure.

RADIATION

1. Introduction.

a) Radiation is a form of energy, such as sunlight. Not all radiation is bad for your body.

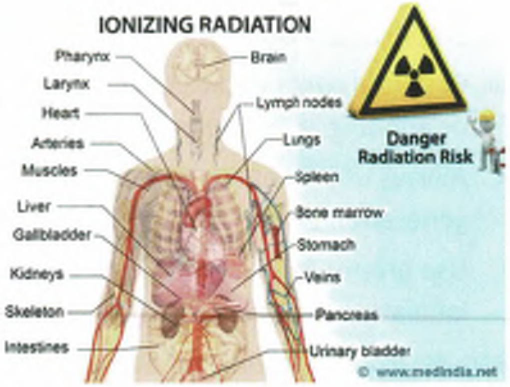
b) The type of radiation that is harmful to the body is called "ionizing radiation". There is enough energy in ionizing radiation to upset the atoms in your body's cells.



2. Health Effects.

a) High levels of ionizing radiation can cause the following:

   I. Cancer
   II. Leukemia
   III. Ulceration
   IV. Genetic changes
   V. Early death



3. Sources of Radiation.

a) Radioactive measuring devices.

   I. Tank level indicators, density gauges, conveyor belt scales, etc.

      1) Radioactive devices are sealed in lead cases that contain a shutter which is open when the device is being used.
      2) Work done on or near the devices must be performed by authorized and trained persons.
      3) The major exposure concern is when part of the body is placed between the open shutter and the receiver.
      4) Contact with the sealed case must be avoided as a precautionary measure. Don't sit on the device while taking a break, eating lunch, etc.
      5) The type of radiation in these devices can penetrate clothing and skin.
      6) Never enter a vessel that contains a radioactive device until the device has been properly locked in the closed position.
      7) Observe all facility warning signs.
      8) All radioactive sources should be labeled with a magenta colored radiation symbol in order to inform all workers of the potential exposure.

b) Naturally Occurring Radioactive Materials (NORM) are present in the mined phosphate ore. TENORM is an acronym for Technologically Enhanced Naturally Occurring Radioactive Material.

  I. TENORM exposure is highest in the phosphoric acid plants around the phosphoric acid filters and associated areas.

  II. The main hazard is cutting or grinding contaminated materials and when welding on filter pans or metal components.

  III. TENORM is an inhalable and ingestible hazard.

  IV. It is important that TENORM is kept from entering the body.

  V. Ingestion can occur by eating, drinking or smoking in the area or without properly cleaning hands.

  VI. Inhalation of phosphoric acid scale can occur by causing the material to become airborne to be inhaled such as when chipping, grinding, welding or during housekeeping.

  VII. Employees should wash hands prior to eating or smoking and after working in these areas.

  VIII. Potential contaminated material should never be cleaned by dry methods such as sand blasting or grinding as the dust can be inhaled through the mouth and nose.

  IX. Always use a wet removal process when working with the TENORM buildup to reduce the generation of dust.

  X. Use proper PPE when welding or cutting TENORM contaminated equipment to prevent inhalation of airborne dusts.

c) Non-destructive testing by radiographers using relatively high radiation sources.

  I. Used to inspect welds on tanks & piping and find imperfections in steel.

  II. Radiography sources are much more intense than the other sealed sources or TENORM sources at phosphate facilities.

  III. It is extremely important for all contractors to adhere to the warnings surrounding an area used for radiography. Even a short exposure to radiographic type sources can be hazardous.

SANITATION AND MEDICAL SERVICES

1. Introduction.

a) OSHA regulations require employers to provide sanitary facilities, water supply, toilet facilities, and eating/drinking locations. In addition, the regulations require the availability of medical services.

2. Water Supply.

a) It is important to have a source of clean drinking water available while working. Due to the location of some work at phosphate facilities, portable dispensers are fairly common.

b) Portable drinking water dispensers must be:

- I. Labeled;
- II. Clean;
- III. Capable of being closed;
- IV. Equipped with a tap
- V. Common drinking cups are prohibited

Easy Pour Spout
Drip resistant spigot for fast, clean pouring.
Screw-Tight Lid
Keep beverages cool and secure with the screw-tight lid.
BPA Free
BPA-Free

3. Toilet and Washing Facilities.

a) Toilets and washing facilities must be available. Normally unattended work locations do not need a toilet and washing facility if the locations have transportation immediately available to nearby facilities.

b) Special types of work including asbestos or lead abatement require special washing facilities. Any contractor activities regarding asbestos (such as floor tile removal) or lead (such as lead-based paint removal) must be coordinated through a facility safety/environmental contact.

4. Eating and Drinking.

a) Eating and/or drinking is not allowed in any area exposed to toxic material.

b) Waste containers must be available for waste food and kept in a sanitary condition.

5. Medical Services and First Aid.

a) The employer must ensure prompt first aid treatment for injured employees, either by providing for the availability of a trained first aid provider at the worksite, or by ensuring that emergency treatment services are within reasonable proximity of the worksite.

b) Many FPP facilities have an on-site medical facility staffed by a nurse.

c) FPP facilities provide trained personnel or are within close proximity to medical facilities.

6. Safety Showers and/or Eyewashes.

a) Must be available where corrosive materials are present.

b) Plumbed units must be flushed weekly.

c) Portable units must be maintained according to manufacturer's recommendations.

d) When working near any corrosive materials, locate the closest shower/eyewash and ensure it functions properly.

e) Eyewash caps must be replaced when removed.

HEAT STRESS - RADIATION REVIEW

1. What two environmental factors play the biggest role in the potential for heat stress illness:

   A. ______________________________

   B. ______________________________

2. Pale, clammy skin, chills, heavy sweating, dizziness, weakness, fatigue describes what type of heat related illness?

   A. Heat Rash
   B. Heat Cramps
   C. Heat Exhaustion
   D. Heat Stroke

3. Which of the following can be used to help prevent heat stress illnesses. (Circle all that are correct)

   A. Schedule hot jobs for the cooler parts of the day.
   B. Wear heavy clothing.
   C. Take more frequent breaks.
   D. Provide shaded or cooled break areas.
   E. Drink water frequently along with sport drinks.
   F. Work faster and take fewer breaks.

4. Complete this sentence. ________________ radiation is the type of radiation that is harmful to the body.

5. What are the three types of radiation sources that can be found in the phosphate industry?

   A. ______________________________

   B. ______________________________

   C. ______________________________

6. TENORM exposure is highest in what part of the phosphate facility?

   A. ______________________________

7. How can TENORM enter the body? (circle all that are correct)

   A. Ingestion can occur by eating, drinking or smoking in the area where TENORM is located.
   B. Failure to properly cleaning hands after working in the area where TENORM is located.
   C. Chipping, grinding, or welding on equipment that contains TENORM.
   D. Dry sweeping material that contains TENORM.

TOC

Personal Protective Equipment

General Requirements for all PPE (29 CFR 1910.132)

1. Introduction.

Every day, thousands of employees risk serious injury while on the job. The hazards they face range from crushing, struck by, caught under, lacerations, burns, electrocution, caustic or corrosive substances.

2. Employer Requirements.

a) Performing a "hazard assessment" of the workplace to identify and control hazards.
b) Identify and provide appropriate PPE for employees.
c) Train employees in the use and care of the PPE.

3. Employee Requirements.

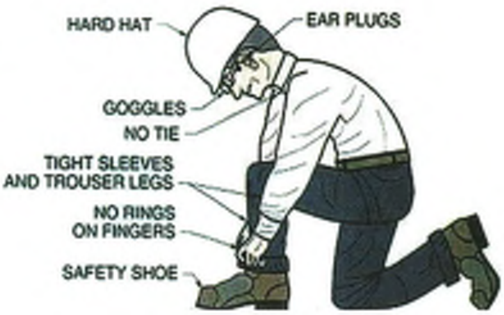
a) Properly wear PPE.
b) Attend training sessions on PPE.
c) Care for, clean and maintain PPE.

4. Hazard Assessment.

a) OSHA requires employers to protect their employees from workplace hazards through the use of engineering or work practice controls. PPE is not a substitute for these controls.
b) When these controls are not feasible or do not provide sufficient protection, the use of PPE is required.
c) Employers are required to assess the workplace to determine if hazards are present, or are likely to be present, that would require the use of PPE.
d) The Hazard Assessment must be certified in writing and kept on file.

5. General.

a) PPE must fit properly to be effective.
b) PPE must not be altered from its original design and specifications.
c) Defective or damaged PPE shall not be used.
d) Most FPP facilities require that all employees wear hard hat, safety glasses with side shields, toe protected work boots and high visibility vest when arriving at the site. Respiratory and hearing protection was already been discussed.
e) FPP facilities exemptions to wearing the PPE would include designated break areas, control rooms / offices and closed cab mobile equipment with the window up.
f) FPP facilities prohibit rings on fingers.
g) FPP facilities prohibit loose dangling jewelry that could get caught into machinery.



TOC

Personal Protective Equipment

Head Protection (ANSI Z89.1)

1. Introduction.

Head protection must be worn when exposed to hazards such as falling objects, impact from the side, front or back, bumping against fixed objects, electrical shock, arc flash, chemical splash, and thermal hazards.

2. Hard Hats Descriptions.

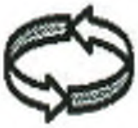
a) Class C provide lightweight comfort and impact protection but offer no protection from electrical hazards.

b) Class G provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).

c) Class E provide impact and penetration resistance along with protection against electrical hazards. (High-voltage shock and burn protection up to 20,000 volts).

d) There are 2 types of hard hats:
   I. Type 1 has the short bill in front and provides protection strictly from blows to the top.
   II. Type 2 has a full brim around the hat and provides protection from blows on the top and from the side.

e) Markings/labeling:
   I. Every hard hat conforming to the requirements of ANSI Z89.1 must be appropriately marked to verify its compliance.
   II. ANSI published a revision in January of 2009. Hard hats marked with a "reverse donning arrow" can be worn frontward or backward in accordance with the manufacturer's wearing instructions. The suspension must be turned around.



3. Hard Hat Use.

a) A proper fit should allow 1 to 1 1/4 inches of space between the shell and the suspension system to help distribute impact. Materials should not be placed between the suspension and the hard hat.

b) The hat should fit so it will not fall off.

c) Should be inspected daily for signs of dents, cracks, penetration and any damage due to impact, rough treatment or wear.

d) Always replace a hard hat if it sustains an impact, even if damage is not noticeable.

e) Although it is not considered a "shelf life", some brand of hard hats do have "Useful Service Life Guidelines". These guidelines suggest replacing the suspension every 12 months and the hard hat after 5 years of use.

f) Ultraviolet (UV) radiation can damage hard hats. Once the effects of UV radiation are detected, the hard hat shell should be immediately replaced. Do not store hard hat in direct sunlight.

g) Paints, paint thinners, and some cleaning agents can weaken the shell.

Personal Protective Equipment

Eye and Face Protection (ANSI Z87.1)

1. Introduction.

Eye or face protection must be worn when exposed to hazards such as:

a) Flying particles, dust, dirt, metal or wood chips entering the eye from activities such as chipping, grinding, sawing, hammering, the use of power tools or even strong wind forces.

b) Molten metal or sparks.

c) Chemical splashes from acid or corrosive substances, hot liquids, solvents, chemical gases or vapors,

d) Potentially infectious material.

e) Flying or swinging objects, tree limbs, chains, tools or ropes.

f) Radiant energy from welding, cutting or lasers.

2. Eye and Face Markings.

a) All eye and face protection must always bear the ANSI Z87 including detachable side shields.

  I. Spectacle frames intended for prescription lenses shall be marked with the manufacturer's mark or symbol and Z87-2 or wear additional ANSI approved eye protection over their prescription lenses.

  II. Contacts may not be safe to wear in some areas. Certain chemicals can actually bond contact lenses to their wearers' eyes.

  III. "Z87 +" would indicate compliance with high velocity impact testing on lenses.

  IV. Side shields must also have the Z87 marking.

3. Types of Eye and Face Protection.

a) Safety Glasses:

  I. Must be worn when exposed to flying objects.

  II. Safety glasses are not appropriate for dusts and powders, which can get by the glasses.

  III. Most FPP facilities do not allow tinted eyewear after sunset or indoors.

b) Dust Goggles:

  I. Should be worn when exposed to excessive dusty conditions such as sanding or buffing, or during high winds or when dust particles are very light and stay suspended.

  II. Safety glasses or dust goggles do not provide adequate protection from significant chemical splashes.

c) Cover/Chemical Goggles:

  I. Must be worn when exposed to chemical splashes, hot liquids, solvents, chemical gases or vapors or potentially infected material.

  II. Chemical splash goggles should have indirect ventilation so hazardous substances cannot drain into the eye area.

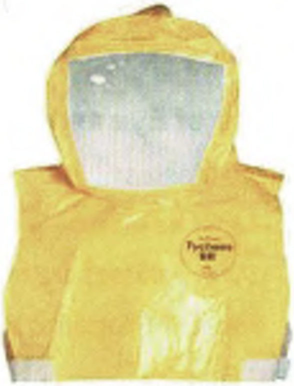
  III. Many FPP facilities require goggles to be in your possession at all times due to the potential for accidental chemical releases or for emergency response.

TOC

d) Face Shields:

- I. Must be worn:
  - 1) When working with large volumes of hazardous materials, or when the hazardous material poses injury to the skin.
  - 2) To protect the employee from impact hazards such as flying fragments, objects, large chips, and particles such as when using stationary or portable grinding, sanding, sawing or cutting equipment.

  - 3) When working with molten metal or hot liquids.
  - 4) To protect from bodily fluids.
  - 5) When potentially injurious light radiation is present.
- II. Face shields must be used in combination with safety glasses or goggles.
- III. Face Shields with built in hoods or bibs:
  - 1) Hoods protect eyes plus face, neck and head. Bibs protect the neck area. They should be used when extreme hazardous conditions are present either due to pressurized chemical release or extreme heat conditions.
- IV. Examples when face shields are required:
  - 1) Working around acids, caustics, heated liquids such as molten sulfur, etc.
  - 2) Operating portable or stationary grinding equipment.
  - 3) Operating a circular, concrete, masonry or reciprocal saw.
  - 4) Opening or cleaning chemical lines.
  - 5) Operating power actuated tools.
  - 6) Cutting metal.
  - 7) Water blasting.
  - 8) Operating a chain saw.
  - 9) Using a hammer to strike other hard surfaces that could project small metal fragments.



TOC

Personal Protective Equipment

Foot Protection (ASTM F2413 - 2005)

1. Introduction.

Foot protection must be worn when exposed to hazards such as:

a) Falling and rolling objects;

b) Crushing due to heavy objects;

c) Objects piercing the sole such as nails or spikes or piercing the top such as hydro blasting;

d) Electrical hazards;

e) Static electricity;

f) Thermal heat hazards;

g) Thermal cold hazards;

h) Chemical hazards such as acids or corrosives.

ASTM
F2413-11
I/75 C/75

ASTM
F2413-11-PR

ASTM
F2413-11-PR

ASTM
F2413-11-EH

2. Types of Footwear.

a) Many FPP facilities have required toe protected, six in high ankle support, laced up, leather footwear.

b) Metatarsal footwear prevents or reduces the severity of injury to the metatarsal and toe areas. Metatarsal resistance (Mt) rating is indicated on the footwear label as either 75 or 50 foot-pounds.

c) Soles with deep tread should be used for muddy conditions. Flat soles footwear should not be used when climbing ladder rungs. Remember no footwear is slip proof.

d) Chemical resistant overshoes or boots may be used to avoid possible exposure to corrosive chemical or large quantities of solvents or water that might penetrate leather or synthetic footwear.

e) Metatarsal construction footwear for working around high pressure water systems made to withstand 40,000 psi.

f) Chainsaw cut protection Class 2 (24/m sec chainsaw speed)

3. Maintenance.

a) Safety footwear should be inspected prior to each use.

b) Replace broken laces.

c) Replace footwear with worn soles.

d) Replace footwear with holes or when stitching is separating in the upper.

e) Replace footwear when soles are separating from the upper.

Personal Protective Equipment

Body Protection

1. Types of Clothing.

a) Paper-like fiber used for disposable suits provide protection against dust, dirt and grease. Many are specially made for working with lead, asbestos and other hazardous particulates.

b) Treated wool and cotton adapts well to changing temperatures and is comfortable. Some are treated with a fire retardant chemical to provide protection from sparks or electrical arc flash.

c) Leather is often used to protect against dry heat and flames such as hot pipes or welding and/or oxy/acetylene cutting operations. Leather can be used for hot chemicals such as molten sulfur.

d) Rubber, neoprene and plastics protect against certain chemicals and physical hazards.

e) Rain suits and disposable paper suits are not designed to protect from hazardous chemicals.

f) High Visibility Clothing:

  - I. Required when working near mobile equipment.
  - II. Required when acting as Signal Person.
  - III. Many FPP facilities require high viz clothing at all times.
  - IV. Many facilities require a five (5) point breakaway vest.
  - V. ANSI 107-2004 has 3 class of vest.
  - VI. Class 1 can be used where:
    - 1) Traffic does not exceed 25 mph.
    - 2) Ample separation from the traffic.
  - VII. Class 2 can be used where:
    - 1) Traffic exceeds 25 mph but not 50 mph.
    - 2) Inclement weather.
  - VIII. Class 3 can be used where:
    - 1) Traffic exceeds 50 mph.
    - 2) Severe weather.

Personal Protective Equipment

Hand Protection

1. Types of Hand Protection.

a) Fabric and Coated Fabric Gloves are made of cotton or other similar material.

   I. They protect against dirt, slivers, chafing and mild abrasions.

   II. They do not provide protection for use with rough, sharp or heavy materials, chemical exposure, bloodborne pathogens, extreme heat or cold and provide no electrical protection.

b) Leather Gloves come in several thicknesses and types of leather.

   I. They protect against abrasive materials, minor sharp objects and heat.

   II. Most leather gloves have a low cut resistant rating.

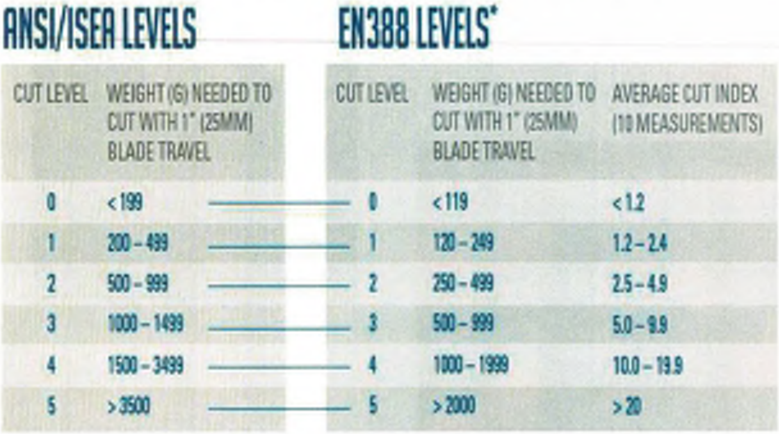
c) Cut Resistant Gloves come in different materials and thickness.

   I. They protect from direct contact with sharp edges such as glass, metal, ceramics and when working with sharp edge tools such as knives and saws.

   II. Coatings enhance grip.

   III. Many FPP facilities require a minimum cut resistant rating of 5.

   IV. Comparison between the ANSI and EN test method:



ANSI/ISEA LEVELS

CUT LEVEL	WEIGHT (G) NEEDED TO CUT WITH 1" (25MM) BLADE TRAVEL
0	< 199
1	200 – 499
2	500 – 999
3	1000 – 1499
4	1500 – 3499
5	> 3500

EN388 LEVELS*

CUT LEVEL	WEIGHT (G) NEEDED TO CUT WITH 1" (25MM) BLADE TRAVEL	AVERAGE CUT INDEX (10 MEASUREMENTS)
0	< 119	< 1.2
1	120 – 249	1.2 – 2.4
2	250 – 499	2.5 – 4.9
3	500 – 999	5.0 – 9.9
4	1000 – 1999	10.0 – 19.9
5	> 2000	> 20

d) Impact Resistant Gloves feature padded palms and flexible Plastic Rubber along the back of the hands and fingers to create a shield against impacts.

e) Chemical Resistant Gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol (PVA) and polyethylene.

   I. Select chemical gloves by considering the type and concentration of chemical, and length of time the gloves are to be worn. Different glove materials resist different chemicals; no one glove is suited for all chemical exposures.

   II. Butyl gloves protect against a wide variety of chemicals, such as peroxide, fuels, highly corrosive acids, strong bases, alcohols, aldehydes, ketones, esters and nitro compounds.

   III. Natural rubber gloves are resistant to a variety of acids, caustics, salts, detergents and alcohols.

IV. Disposable latex gloves protect against blood and other body substances, but may cause allergic reactions in some individuals.

V. Neoprene gloves are made of synthetic rubber and protect against hydraulic fluids, gasoline, alcohols, many acids, caustics, oils and alkalis.

VI. Nitrile gloves are also a synthetic rubber and provide protection from solvents, oils, greases and some acids and corrosives but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

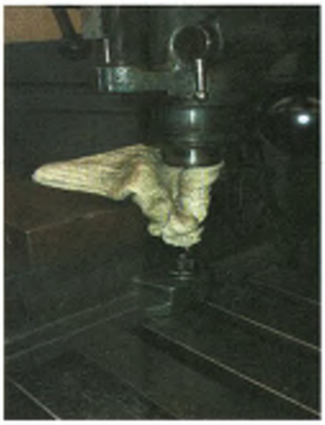
VII. PVC gloves provide excellent abrasion resistance and protect from acids and petroleum hydrocarbons.

VIII. PVA gloves provide protection from aromatic and chlorinated solvents. Cannot be used in water or water-based solutions.

IX. Viton gloves provide exceptional resistance to chlorinated and aromatic solvents.

X. Chemical gloves should be visually inspected before each use to ensure that they are not torn, punctured or made ineffective in any way.

XI. Gloves should be removed avoiding skin contact with the exterior of the glove and possible contamination.



2. General Use.

a) Gloves must not be worn while working around machines that present a grabbing hazard.

b) Make sure gloves fit correctly.

Personal Protective Equipment

Water Safety

1. Introduction.

a) Life jackets (PFD) shall be worn where there is danger from falling into water.

2. Personal Floatation Protection (PFD).

a. TYPE I PFDS / OFF-SHORE LIFE JACKETS: Best for all waters, open ocean, rough seas, or remote water, where rescue may be slow coming. They provide more buoyancy than other types and are designed to turn most unconscious wearers in the water to a face-up position. Must meet a 22 pound buoyancy.

b. TYPE II PFDS / NEAR-SHORE BUOYANT VESTS: For general boating activities. Good for calm, inland waters, or where there is a good chance for fast rescue. They will turn some unconscious wearers to a face-up position in the water, but the turning action is not as pronounced as with Type I PFDs. Must meet a 15.5 pound buoyancy.

c. TYPE III PFDS: For general boating or the specialized activity that is marked on the device such as skiing, hunting, fishing, canoeing, and others. Good for calm, inland waters, or where there is a good chance for fast rescue. Wearers will usually have to turn themselves face-up in the water and may have to lean back to avoid turning face-down. Must meet a 15.5 pound buoyancy.

d. Type V PFDs: Are for special-use & designed for particular water activities. Must be used according to the approval condition on the label often stipulating how they should be worn. With air inflatable PFDs the primary motivator for design is to encourage wearing it. Automatic inflatable types are not allowed in most mobile equipment operations. Inflatables must meet a 22.0 to 34.0 pound buoyancy. Foam type must meet a 15.5 to 22.0 pound buoyancy.

e. A buoyancy chart is located on the following page.

Type I vest - 22lb

Type III vest - 15.5lb

Type V vest -17.5lb

f. Many FPP facilities have minimum requirements on the type of PFD that is allowed.

g. Inspect the PFD before use. Some inflatables require an additional annual inspection.

TOC

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FALL PROTECTION

1. Introduction.

a) Fall protection is a complicated issue and one of the most important faced by an employer or worksite supervisor. With more than 100,000 reported incidents per year, falls from heights almost always result in serious injury. In construction industry, falls are the leading cause of worker death.

b) There are several written standards that describe when fall protection is required:

   I. OSHA 29 CFR 1910 (general industry) requires fall protection anytime working 4 feet above the lower level or at any height if a fall could occur into or onto dangerous equipment.

   II. OSHA 29 CFR 1926 (construction industry) requires fall protection anytime working 6 feet above the lower level.

   III. All FPP facilities use the 4 foot rule.

c) In addition to the regulations, there are two ANSI standards used as reference material for this training program. They are "A10.32-2012 Personal Fall Protection for Use in Construction and Demolition Operation" & "ANSI Z359.1 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components".

2. Fall Hazards.

a) Example of fall hazards are:

   IV. Openings in walking/working surfaces that worker could fall through

   V. Skylights that workers could step into or fall through.

   VI. Wall openings that have an inside bottom edge less than 39 inches above walkway.

   VII. Floors, mezzanines, balconies, and walkways 4 foot above the lower level with unprotected sides and edges.

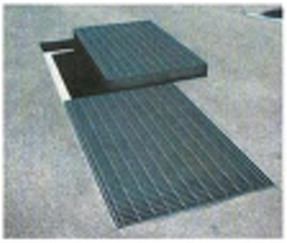
   VIII. Excavations that are not sloped.

   IX. Cargo loading areas where guardrails have been removed to receive materials.

   X. Leading edges of floors, roofs, and decks.

   XI. Wells, pits, or shafts not protected with guardrails, fences, barricades, or covers.

   XII. Large mobile equipment during maintenance activities.



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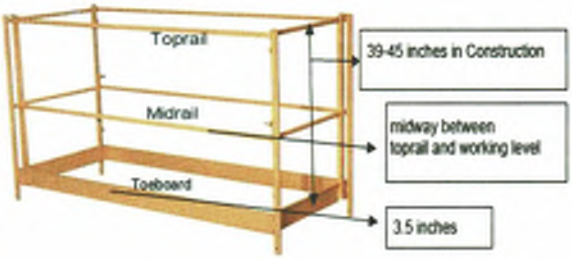
3. Types of Fall Protection.

a) Guardrail Systems:


Toprail
39-45 inches in Construction
Midrail
midway between toprail and working level
Toeboard
3.5 inches

- I. Preferred means of fall protection. Consists of handrail (39" to 45"), midrail (21") and toe plate (4" high).
- II. Capable of withstanding 200 pounds of force applied in any direction.

b) Hole Covers:

- I. Capable of withstanding two times the intended weight.
- II. Secured to prevent displacement.
- III. Color coded or marked with the work Hole or Cover to provide a hazard warning.
- IV. Many facilities require that when the cover is removed, a hard temporary guardrail system must be put in place. When a temporary guardrail is not used, a soft barricade system can be used with a Safety Watch the entire time the cover is open.

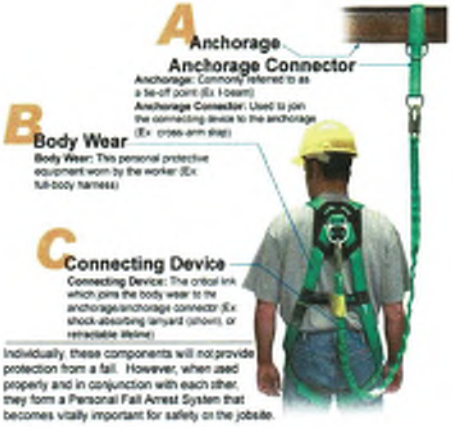
c) Personal Fall-Restraint System:

- I. A personal fall-restraint system prevents a worker from reaching an unprotected edge and thus prevents a fall from occurring.
- II. The system consists of an anchorage, connectors, and a body harness or a body belt.
- III. The attachment point to the body belt or full-body harness can be at the back, front, or side D-rings.
- IV. The anchorage for a fall-restraint system must support at least 3,000 pounds or be designed and installed by a qualified person and have a safety factor of at least two. The latest ANSI standard allows for a 1,000 pound rated anchorage.
- V. Are only permitted on a working surface with a slope between 0 and 18.4 degrees.

d) Positioning-Device System:

- I. Allows the workers to be supported on an elevated vertical or inclined surface such as a wall, fixed ladder or pole and to work with both hands free.
- II. A positioning-device system provides support and must stop a free fall within two feet.
- III. The system consists of an anchorage, connectors, and a body harness or a body belt.
  - A. Must be secured to an anchorage that can support 3,000 pounds.
  - B. Connectors must have a minimum strength of 5,000 pounds.
  - C. A body belt is allowed, however, it must limit the arresting force on a worker to 900 pounds and it can only be used for body support.

e) Personal Fall Arrest System:


A Anchorage
Anchorage Connector
Anchorage: Commonly referred to as a tie-off point (Ex: I-beam)
Anchorage Connector: Used to join the connecting device to the anchorage (Ex: cross-arm strap)
B Body Wear
Body Wear: This personal protective equipment worn by the worker (Ex: full-body harness)
C Connecting Device
Connecting Device: The critical link which joins the body wear to the anchorage/anchorage connector (Ex: shock-absorbing lanyard (shown), or retractable lifeline)
Individually, these components will not provide protection from a fall. However, when used properly and in conjunction with each other, they form a Personal Fall Arrest System that becomes vitally important for safety on the jobsite.

- I. Consists of an anchorage, connectors, and a full-body harness that work together to stop a fall and to minimize the arrest force.
- II. Will be rigged so that the worker can neither free fall more than six (6) feet nor contact any lower level.
- III. Dacron or polyester equipment is to be used around corrosive or caustic materials. Nylon material may degrade and fail even after inspection.
- IV. Anchorage points:
  - A. Must be capable of supporting 5,000 pounds (22kN) of force per worker.
  - B. The anchorage should be located directly above the worker, if possible, to reduce the chance of a swing fall. 15 degrees is the maximum angle allowed.
  - C. The following should not be used as anchorage: standard guardrails & railings, ladders, scaffolding unless designed, light fixtures, conduit or plumbing, ductwork or pipe vents, wiring harnesses, fans, and roof stacks.
  - D. Anchorage points come in a variety of types, both permanent and temporary. Some examples are:
    - 1) D-Bolt or D-ring anchors that mount to steel.
    - 2) Concrete temporary anchors.
    - 3) Roof anchors.
    - 4) Cross-arm straps.
    - 5) Beam Clamps.
    - 6) Trailer or hitch mounted.
    - 7) Mounted davit arm.

  - E. Horizontal Life Line:
    - 1) Stretches between two anchorages. Allows worker to move about freely, thus reducing the risk of a swing fall. However, horizontal lifelines are subject to much greater loads. For this reason, horizontal lifelines must be designed, installed, and used under the supervision of a qualified person.
    - 2) In pre-engineered horizontal lifeline kits, the manufacturer assumes the responsibility for the engineering design of the system.
    - 3) The sag angle is a horizontal lifeline's angle of deflection when it's subjected to a load, such as a falling worker. Reducing the sag angle (making a horizontal lifeline too tight) actually increases the force on the line during a fall.

TOC

F. Vertical Life Line:

1) Vertical lifelines attach to an overhead anchorage and must be connected directly to a worker's full-body harness via lanyard, retractable device, or rope grab.

2) It must have a minimum breaking strength of 5,000 pounds.

3) Rope grabs are designed to stop the free fall from 1 – 3 feet. Many manufactures require the use of a 3 foot lanyard in place of a 6 foot lanyard.

V. Connectors / Lanyards:

A. Lanyards allow the worker to connect their harness to the anchor point, horizontal or vertical life line. They must have a minimum breaking strength of 5,000 pounds.

B. In order to reduce the force of the fall on the body to less than 900 pounds, the lanyard must include a shock-absorber device or be a self-retracting type.

C. Do not combine lanyards to increase length.

D. Do not knot them to make them shorter.

E. Do not tie them back onto themselves unless designed to do so. Use tie back lanyards if needed.

F. Do not exceed the rated capacity of the equipment. Many have a maximum rating of 310 pounds. That includes any tools carried.

G. Only use snap hooks and carabiners that have locking gates.

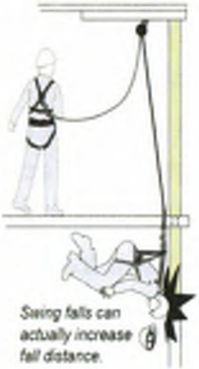
H. Many FPP require 100% tie off which in most cases require a double lanyard.

I. Because a shock-absorbing lanyard extends up to 3.5 feet, it's critical that the lanyard stops the worker before the next lower level. Allow about 18 vertical feet between the worker's anchorage point and the level below the working surface.

How to calculate total fall distance: Lanyard length (6 feet) + deceleration distance (3.5 feet) + stretch of the harness (2.5 feet) worker's height (6 feet) = 18 vertical feet from anchorage to lower level.

VI. Self-Retracting Lanyards (SRL)

A. Offer more freedom to move than shock-absorbing lanyards. Each has a drum-wound line that unwinds and retracts as the worker moves. If the worker falls, the drum immediately locks, which reduces free-fall distance to about two feet or less, if the anchorage point is directly above the worker.


Swing falls can actually increase fall distance.

B. Beware of swing falls! The farther you move away from the anchorage, the farther you will fall and the greater your risk of swinging back into a hard object. You should never exceed 12 feet or 15 degrees, whichever is less.

C. SRL should be used anytime when working at heights between 4 feet and 18 feet.

D. Not all SRLs can be used in the inverted position. Be sure the manufacturer allows this type of use.

E. Inspection includes the entire length of cable or webbing, the locking snap hook, load indicator, locking device and anchor attachment.

VII. Full Body Harness (FBH):

  A. The only form of body wear acceptable for fall arrest.
  B. The back D-ring must be located between the users shoulder blades.
  C. Chest straps should be adjusted so they do not allow the shoulder straps to slide off.
  D. The leg straps must be snug to prevent injury if a fall occurs.
  E. Must be properly sized for the worker.

4. Inspection – Service Life.

a) Inspect all components before each use.

b) Annual inspection by a competent person other than the user must be conducted & documented.

c) If unsafe conditions are found, the equipment must be removed from service and marked "UNUSABLE" until repaired or destroyed.

d) ANSI A10.32-2004, does not reference a 5 year service life. The standard states that fall protection equipment shall be removed from service upon evidence of defects, damage or deterioration; once it has been subjected to impact loading; or upon expiration of the manufacturer's specified service life, whichever comes first.

5. Post Fall Suspension.

a) If a worker is suspended in a personal fall-arrest system, you must provide for a prompt rescue.

b) Prompt means immediately. A worker suspended in a harness after a fall can lose consciousness if the harness puts too much pressure on arteries.

c) Prolonged suspension from fall arrest systems can cause blood to accumulate in the veins, which is commonly called "venous pooling," which can cause orthostatic intolerance. This can result in serious physical injury or death. This condition can occur in less than 30 minutes, sometimes as quickly as 14 minutes.

d) Suspension trauma devices used as part of the harness can delay or prevent venous pooling.

6. Fall Protection Applications - Aerial Lift Devices.

a) Although the primary means of fall protection in aerial lift devices are the guardrails, the use of a personal fall restraint system is required by most manufacturers and FPP facilities.

b) FBH with back D-ring and an adjustable-length restraint lanyard rigged as short as practical to an anchor located low in the platform interior to prevent ejection from platform.

c) If a SRL is used, determine if it can be inverted.

7. Training.

a) Employers are required to provide training to all workers who may be exposed to fall hazards.

b) Training includes maintaining, using and inspecting the fall protection systems to be used.

c) Retraining is required when changes are made to the fall protection provided or when workers knowledge indicates the previous training is not sufficient.

TOC

FALL PROTECTION REVIEW

1. The phosphate industry requires fall protection when working 4 feet above the lower level.

   [✓ A. True]
   B. False

2. List the 5 types of fall protection listed in this training program.

   A. Guardrail Systems
   B. Hole Covers
   C. Personal Fall-Restraint System.
   D. Positioning -Device System
   E. Personal Fall Arrest Systems

3. What is required by the phosphate industry when a hole cover is removed. (Circle all that are correct)

   [✓ A. Fall arrest system when not protected by a hard barricade.]
   [✓ B. Temporary hard barricade.]
   C. Barricade tape with cones and signs.
   [✓ D. Barricade tape properly tagged along with safety watch.] (only temporarily
   E. All the above answers are correct.

4. Complete this sentence. Free fall distance for a fall arrest system should be rigged so your fall is no more than 6 feet.

5. What material should not be used for fall protection in a corrosive environment?

   [✓ A. Nylon.]
   B. Polyester.
   C. Dacron
   D. All the above answers are correct.

6. Which of the following would **NOT** make a good anchor point for fall arrest system? (Circle all that are correct)

   [✓ A. Light fixtures]
   [✓ B. Conduit or plumbing]
   [✓ C. Ductwork or pipe vents]
   D. Steel beam
   [✓ E. Roof stacks]

7. A Self Retracting Device should be used when a fall hazard exist between 4 – 18 feet?

   [✓ A. True]
   B. False

ELECTRICAL SAFETY

1. Hazards of Electrical Current.

a) The effects of electricity on the human body depend on the amount of current, where the current passes and the length of time exposed.

b) An electric shock, which affects the cardiovascular and pulmonary (heartbeat and breathing) can cause death with less than one ampere of current over a time period of less than one second.

c) Electric shocks can cause contractions of muscle tissue to the extent that bones may break or breathing is restricted.

d) The current passing through the chest can cause cardiac fibrillation, interrupting the natural heartrate and flow of the bloodstream which can lead to death.

e) Other effects of high levels of current passing through the body are:

   I. Burns;

   II. Hemorrhages, tissue destruction, damaged nerves and muscles as a result of burns;

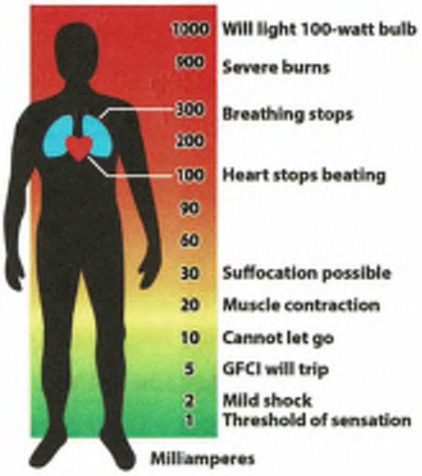
   III. Reaction to shock may cause falls and subsequent injury.

f) All effects of a shock may not be obvious at first glance. There may be delayed effects.

g) A qualified medical professional should evaluate all shock injuries.

h) One amp is the same as 1000 milliamperes

Electricity's Effects



2. Preventing Electrical Shock

a) Inspect all cords, connections and guards on electrical tools and equipment before each use.

b) Never use worn or frayed electrical cords.

c) Never use extension cords with a missing ground prong.

d) Never use any electrical cord with loose prongs or signs of overheating.

e) Use only industrial extension cords with a minimum rating of 14 gauge. A 12 gauge cord is recommended when using long lengths of cords over 100 feet.

f) Electrical cords that have a defect should be tagged out of service or have the plug end cut.

g) Electrical cords should not be patched or repaired. If the plug end needs to be replaced, use an approved weather-tight plug.

h) Electrical cords passing through work areas including roadways, should be covered, bridged, elevated or protected by other means.

i) Extension cords must not be fastened with staples, nails or suspended by other wires.

j) Do not work in close proximity to an unguarded energized circuit until the circuit is de-energized, locked out and tagged out (LOTO).

k) Workspaces for electrical equipment should not be used as passageways when energized electrical equipment is exposed.

3. Lighting & Outlets

a) Portable extension lights, and other lights that by their location presents a shock or burn hazard, shall be guarded.

b) Lamp sockets shall be of a weatherproof type where they are exposed to weather or wet conditions that may interfere with illumination or create a shock hazard.

4. Ground Fault Circuit Interrupter (GFCI)

a) A GFCI is not an overcurrent device like a fuse or circuit breaker. GFCI's are designed to sense an electrical imbalance in current flow over the normal pathway. GFCI's are designed to protect the user of the equipment, not the equipment. Fuses and circuit breakers are designed to protect equipment.

b) A GFCI senses leaks of very low levels of current (5 milliamps) and opens the circuit in a fraction of a second, thus interrupting the flow of electrical current.

c) Because GFCI's are installed at the power source (outlet), the operator, equipment and cords will be protected.

d) GFCI's should be used in places that are likely to be wet, which increases the chance of electrical shock.

e) OSHA requires a GFCI be used for all electrical hand tools or use an Assured Grounding Program.

f) GFCI should be tested before use to ensure they are operating correctly if needed.

g) Some FPP facilities require a GFCI anytime an extension cord is used.

5. Assured Grounding Program.

a) When using an Assured Grounding Program in place of GFCI's to meet OSHA requirements, the following elements must be implemented:

  I. Have a written insured equipment grounding program.
  II. This program should outline the employer's specific procedures for the required equipment inspections, test, and test schedule.
  III. Testing includes all power cord sets, receptacles which are not part of the permanent wiring of the building or structure and equipment connected by cord and plug available for use or used by employees;
  IV. The employer is required to designate one or more competent persons to implement the program;
  V. Electrical equipment noted in the program must be visually inspected for damage or defects before each day's use.
  VI. Test shall be performed and recorded on all cord sets, receptacles and cord or plug-connected equipment required to be grounded;
  VII. Grounding connectors shall be tested for continuity; and
  VIII. Receptacles shall be tested for correct attachment of the grounding wire.
  IX. Test records shall identify each receptacle, cord set and all plug connected equipment.
  X. Test records shall be made available on the job site for inspection.

6. Double-Insulated Electrical Tools

a) Double-insulated electrical tools are designed so that the inner electrical parts are isolated physically and electrically from the outer housing, which is usually made of a non-conducting material.

b) Double-insulation does not protect against defects in the plug, cord or receptacle.

c) Double-insulated tools only have two prongs. The ground is not required.

d) It is important to ensure your tool is truly double insulated since some older tools may have only two prongs.

7. Electrical Splices.

Permanent splices and repairs made in power cables, including the ground conductor where provided, shall be;

a) Mechanically strong with electrical conductivity as near as possible to that of the original;

b) Insulated to a degree at least equal to that of the original, and sealed to exclude moisture; and

c) Provided with damage protection as near as possible to that of the original, including good bonding to the outer jacket.

8. Electrical Equipment.

a) Suitable danger signs shall be posted at all major electrical installations.

b) Areas containing major electrical installations shall be entered only by authorized persons.

c) Power wires and cables shall be insulated adequately where they pass into or out of electrical compartments. Cables shall enter metal frames of motors, splice boxes, and electrical compartments only through proper fittings. When insulated wires, other than cables, pass through metal frames, the holes shall be substantially bushed with insulated bushings.

9. Electrical Marking.

a) Electrical equipment must be marked to include manufacturer's name trademark and voltage.

b) Each service, feeder, and branch circuit, at its disconnecting means, shall be legibly marked to indicate its purpose unless located and arranged so that the purpose is evident.

c) Circuit breakers shall clearly indicate whether they are in the open (off) or closed (on) position.

d) Where circuit breaker handles are mounted vertically rather than horizontally, the up position of the handles shall be the closed position.

e) If used as switches in 120 V fluorescent lighting circuits, circuit breakers shall be approved for that purpose and marked "SWD".

10. Working Clearances and Guarding.

a) Working spaces around electrical equipment are not to be used for storage.

b) Adequate illumination shall be provided for all working spaces around electrical equipment.

c) Energized parts of electrical equipment operating at 50 V or more shall be guarded against accidental contact by one of the following:

  I. Approved cabinets or other types of approved enclosures;
  II. By location in a room, vault or similar enclosure that is accessible only to a qualified person;
  III. By permanent partitions or screens so arranged that only qualified persons will have access to the space;
  IV. By location on a suitable balcony, gallery or platform; or
  V. By elevation of 8 feet or more above the floor or other working surface.

11. Arc Flash / Arc Blast Hazards.

a) Arc flash occur from high amperage currents (3 phase generally 440 volt or above) arcing through air.

b) Arc flash can occur when an energized high voltage/amperage wire shorts to ground or when two energized high voltage/amperage wires are shorted together.

c) Temperatures as high as 35,000 F have been recorded in tests. Arc flash can also produce:

  I. Thermal radiation
  II. Pressure waves
  III. Projectiles
  IV. Explosions and Fires

d) An arc flash can occur by simply engaging or disengaging electrical disconnect switch gear or starter panel switches. This can happen for several reasons:

  I. A bolt or screw loosens or is left inside the panel allowing it to drop onto energized parts.
  II. Equipment failure due to use of substandard parts, improper installation, or even normal wear and tear.
  III. Breaks or gaps in the insulation.
  IV. Dust, corrosion or other impurities on the surface of the conductor.
  V. A tripped starter panel could be an indication there is a short.

e) Only trained and authorized personnel are allowed to engage and disengage high voltage switch gear or starter panels.

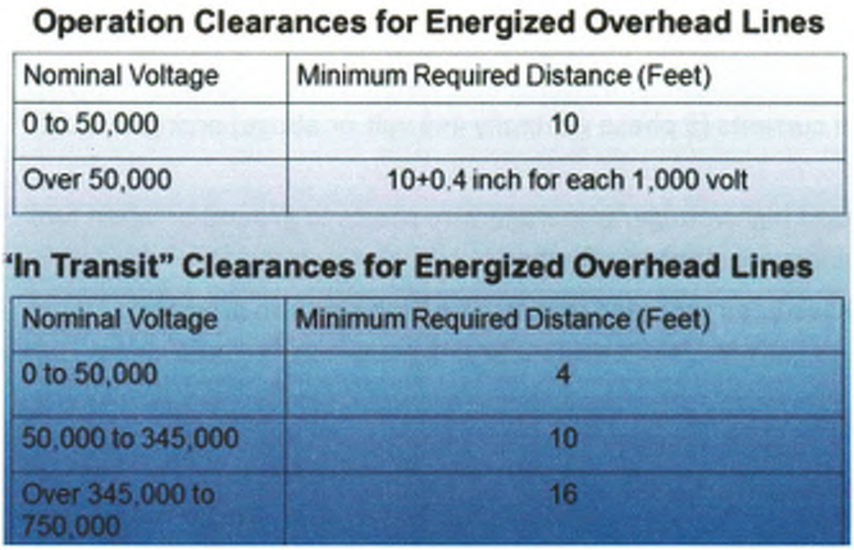
  I. Arc flash PPE is required along with special techniques are used to minimize injury if an arc flash does occur.

12. High Voltage Overhead Line (HVOL).

a) Always be aware of HVOL when operating mobile equipment with raised booms, buckets, forks or man-baskets.

b) Always use non-conducting ladders or scaffolding when working around energized electrical circuits.

c) Maintain a minimum distance of ten (10) feet when working near energized lines of 50,000 volts or less.



Operation Clearances for Energized Overhead Lines

Nominal Voltage	Minimum Required Distance (Feet)
0 to 50,000	10
Over 50,000	10+0.4 inch for each 1,000 volt

"In Transit" Clearances for Energized Overhead Lines

Nominal Voltage	Minimum Required Distance (Feet)
0 to 50,000	4
50,000 to 345,000	10
Over 345,000 to 750,000	16

d) When mobile equipment does accidentally come in contact with overhead lines, special techniques must be used.

   I. If safe to do so, back the mobile equipment away from the energized overhead line.
   II. Keep others at least 100 feet away.
   III. Stay inside the vehicle if possible. Do not get out while vehicle is in contact with energized line.
   IV. Have overhead power line de-energized.
   V. If you must exit, jump far from the vehicle and keep feet together. Bunny hop or shuffle feet to move away.

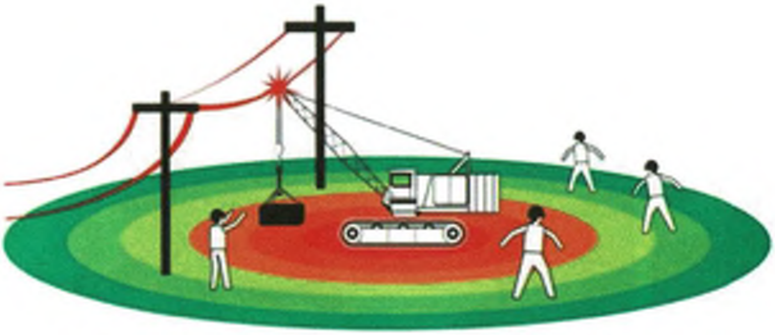
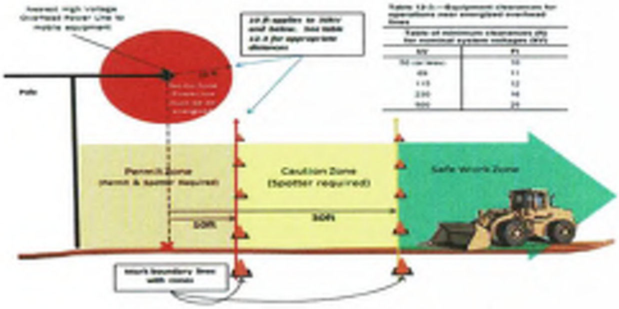


Figure 1.1 Step potential caused by crane-power line contact

e) Some FPP facilities have implemented additional precautions when working around HVOL. The following is an example of some of those policy requirements:

- I. Applies to equipment operation and travel near HVOL.
- II. Activities included: Excavation, Reclamation, Earth moving, Demolition, Loading/Unloading Equipment, New Equipment Installation, Staging/Storage of Equipment, Transporting of Equipment/Materials, and Equipment Traveling.
- III. Equipment included: Loaders, Excavators, Tractor Trailers, Mobile Cranes, Aerial Lifts, Forklifts, Ditchers, Dump Trucks, Dedicated Pile Drivers, Any equipment that has the ability to extend into the 10-foot radial zone.
- IV. One of the first things that you must do is determine the voltage of each power line and the height of the powerline that you are working near.
- V. You must never encroach on the Danger Zone with any part of the equipment or load unless it is de-energized and grounded. The Danger Zone varies with voltage.
  - A. 50,000 volts or less = 10 feet
  - B. 69,000 volts = 11 feet
  - C. 115,000 volts = 12 feet
  - D. 230,000 volts = 16 feet
  - E. 500,000 volts = 25 feet

- VI. Other controls that may be allowed would be HVOL proximity sensors or crane limiting devices that prevent the boom from extending into the Danger Zone.
- VII. You must know the full extension distance of your equipment. Even if you do not plan to extend the equipment fully, the full extension distance must be used to determine the potential risk.
- VIII. Special permit & spotter required if equipment will be used within the horizontal Danger Zone.
- IX. Only a spotter is required if equipment will be working within the horizontal Caution Zone.
- X. Traveling parallel to the HVOL has several factors that must be considered:
  - A. If load extends beyond 4 feet on either side and will be within the 30 feet horizontal zone, a spotter is required.
  - B. If load is within the 10 feet horizontal zone, a permit and spotter is required.
- VIII. Crossing under the HVOL has several factors that must be considered:
  - A. If equipment or load extends 14 in height and the HVOL is 24 feet and clearly marked, then a permit and spotter is required.
  - B. If the HVOL is not marked, you will need to measure and determine clearance distance.
- IX. There are measuring devices to determine the height of the HVOL such as the Suparule.
- X. Spotters must receive training on their responsibilities before performing the task.



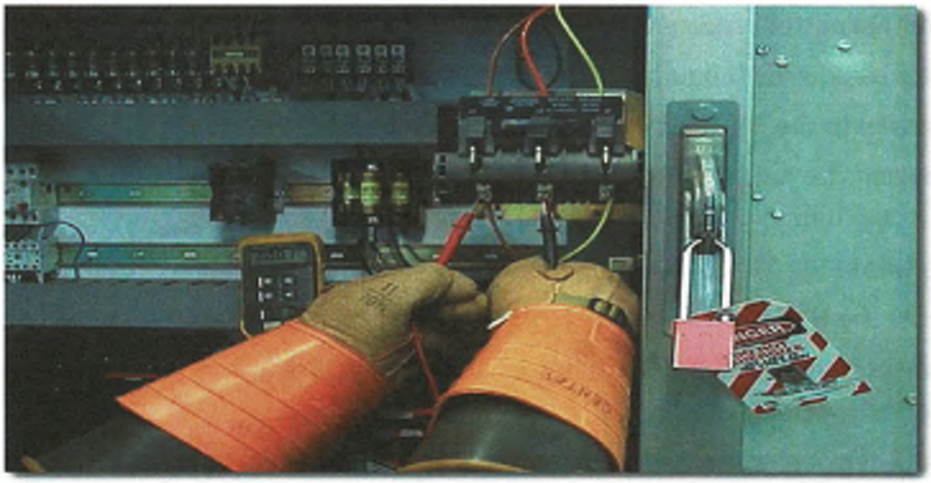
13. Performing Work on Electrical Power Circuits.

a) Power circuits shall be deenergized before work is done on such circuits unless hot-line tools are used. Suitable warning signs shall be posted by the individuals who are to do work. Switches shall be locked out or other measures taken which shall prevent the power circuits from being energized without knowledge of the individuals working on them. Such locks, signs, or preventative devices shall be removed only by the person who installed them or by authorized personnel.

b) OSHA has several standards that address safe work practices for working on or near electrical hazards:

> **29 CFR 1910.269 (l)(8)(i):** Requires estimate of incident energy be determined.
>
> **29 CFR 1910.332 (b)(1):** Employees shall be trained in and familiar with the safety-related work practices required that pertain to their respective job assignments.
>
> **29 CFR 1910.333 (b)(2)(iv)(B):** A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are deenergized
>
> **29 CFR 1910.335 (a)(1)(i):** Employees working in areas where there are potential electrical hazards shall use electrical protective equipment appropriate for the specific parts of the body for the work being performed.
>
> **29 CFR 1910.335 (a)(2):** Employees shall use insulated tools or handling equipment when working near exposed energized conductors or circuit parts.

c) Although these would seem adequate, but none give the details the National Fire Protection Association (NFPA) 70E does. Both OSHA and MSHA use NFPA 70E to ensure the safety of the employees working on or near energized electrical circuit parts.



NFPA 70E ELECTRICAL SAFETY IN THE WORKPLACE

1. Scope.

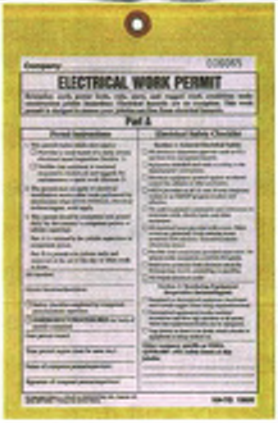
a) Specify electrical safety requirements to protect personnel who work on or near electrical equipment operating at 50 volts or more. Provides safeguards for employees & contractors during activities (e.g., installation, maintenance & demolition).

b) This standard does not apply to electrical installations in ships, automotive vehicles, railway rolling stock, watercraft, underground mines, self-propelled mobile surface mining machinery and communication equipment.

2. Energized Electrical Work.

a) The most important principle of NFPA 70E is the avoidance of conducting energized electrical work unless it is justified.

b) All energized electrical work (with the exception of voltage testing/metering & troubleshooting by Qualified Persons) may be performed only when an Energized Electrical Work Permit (EEWP) is approved by management.



ELECTRICAL WORK PERMIT

c) There are only three allowable justifications for work on energized electrical equipment. Inconvenience is not an acceptable justification.

d) The three acceptable justifications are:

   I. Greater Hazard is when the de-energizing is not reasonably practicable and introduces additional or increased hazards to personnel or the community. Examples are:

      A. The deactivation of emergency alarm systems;

      B. Shutdown of hazardous location ventilation equipment;

      C. Deactivation of an electrical panel that would shut down production analyzers resulting in an uncontrolled production process;

e) Infeasible is when the task to be performed is infeasible in a de-energized state because of equipment design or operational limitations. Examples may include:

   I. The performance of diagnostics and testing (e.g., voltage testing);

   II. Work on electric circuits that form an integral part of a continuous process that would otherwise need to be completely shut down.

Note: If the continuous process could be scheduled for a shutdown such as during night shift or during a schedule turn around, the task should be postponed if possible.

f) Low Voltage – energized conductors or circuit parts are operating at less than 50 volts.

Note: many FPP facilities may allow the Qualified Person to conduct visual inspections without an EEWP only if they are crossing the Limited Approach Boundary but the Restricted Approach Boundary will not be crossed.

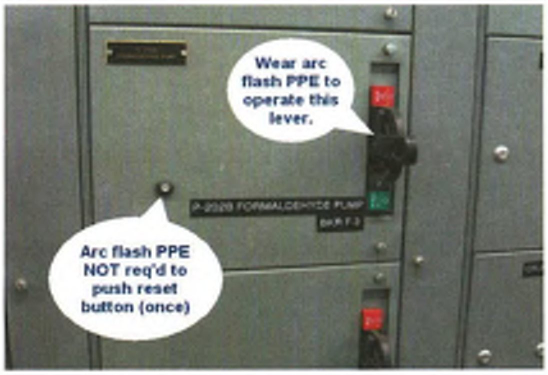
3. Electrical Safe Work Condition.

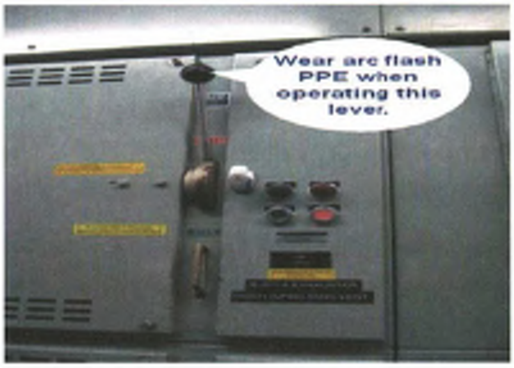
a) As noted above, the most important principle of NFPA 70E is the avoidance of conducting energized electrical work. In order to do that, the qualified person must achieve an Electrical Safe Work condition.

b) An Electrically Safe Work Condition shall be achieved by the following process:

c) Determine all possible sources of electrical supply (e.g. voltage) to the specific equipment.

d) Don appropriate PPE and interrupt the load current by opening disconnecting device(s).


Wear arc flash PPE to operate this lever.
Arc flash PPE NOT req'd to push reset button (once)
P-202B FORMALDEHYDE PUMP



e) Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that draw-out-type circuit breakers are withdrawn to the fully disconnected position.

f) Use an adequately rated voltage detector to test each phase conductor while wearing volt rated PPE (gloves & possibly sleeves) and arc flash PPE. Verify that the voltage detector is functioning satisfactorily before and after each test using a known source.

g) Install temporary protective grounding devices where necessary, such as when there is the possibility of induced voltages or stored electrical energy.

h) Apply lockout devices in accordance with facility procedure.

i) Once locks are in place and control circuits have been tried, the Qualified Person may reduce the PPE level. Electrical conductors that have been disconnected, but not locked out, tested, and grounded (where appropriate) shall not be considered an electrically safe work condition. In this case, PPE defined by the Hazard Warning Labels posted shall be used.

j) Some facilities have determined that in some cases a single toggle-type light switch is considered a disconnect switch and can be locked out by a Qualified Person. Lighting that is controlled by multiple light switches or with multiple power sources will need to be locked out at the circuit breaker.

4. Shock Hazards.

a) Qualified Persons must wear rubber insulating gloves when crossing the Restricted Approach Boundary along with the appropriate leather protectors.

b) Rubber insulating sleeves may also be required if parts of the persons arm crosses the Restricted Approach Boundary.

c) The Limited Approach Boundary is the distance that only Qualified Person can cross when there is exposed energized electrical conductors or circuit parts. Qualified Person(s) are responsible for keeping Unqualified Persons out of the Limited Approach Boundary.

(Table for Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection)

Nominal System Voltage (phase to phase)	Limited Approach Boundary (exposed moveable circuit parts)	Limited Approach Boundary (fixed circuit parts)	Restricted Approach Boundary (includes inadvertent movement adder)	Prohibited Approach Boundary
Less than 50V	Not specified	Not specified	Not specified	Not specified
50V to 300V	10 feet	3 ft, 6 inches	Avoid contact	Avoid Contact
301V to 750V	10 feet	3 ft, 6 inches	1 foot	1 inch
751V to 15 kV	10 feet	5 feet	2 ft, 2 inches	7 inches
15.1 KV to 36 KV	10 feet	6 feet	2 ft, 7 inches	10 inches
36.1 KV to 46 KV	10 feet	8 feet	2 ft, 9 inches	1 ft, 5 inches
46.1 KV to 72.5 KV	10 feet	8 feet	3 ft, 3 inches	2 ft, 2 inches
72.6 KV to 121 KV	10 ft, 8 inches	8 feet	3 ft, 4 inches	2 ft, 9 inches
138 KV to 145 KV	11 feet	10 feet	3 ft, 10 inches	3 ft, 4 inches

d) Remember, the Approach Boundaries only apply when energized conductors and circuit parts are exposed.

e) Rubber insulating gloves shall be inflated manually or with a glove inflator and tested for any leaks, before use by the Qualified Person.

f) Third party dielectric testing in accordance with the table below shall also be completed and the test date or expiration date indicated on the rubber insulating gloves.

Type of Rubber Insulating Equipment	When To Test
Blankets	Before first issue and every 12 months thereafter.
Gloves	Before first issue and every 6 months thereafter

g) When there is a need for an unqualified person to cross the Limited Approach Boundary, a Qualified Person shall advise them of the hazards and continuously escort the unqualified person while inside the Limited Approach Boundary.

h) Unqualified persons shall not be allowed to cross the Restricted Approach Boundary even if escorted by a Qualified Person.

i) Crossing the Prohibited Approach Boundary is considered to be the same as making contact with exposed energized conductors. The Prohibited Approach Boundary requires similar techniques as does the Restricted Approach and future versions of NFPA 70E may have removed this boundary from the standard.

5. Arc Flash Hazards.

a) An Arc Flash Hazard Analysis identifies the potential incident energies to which personnel could be exposed and the level of PPE required. Equipment that poses a known arc flash hazard to personnel will be field labeled indicating that hazard.

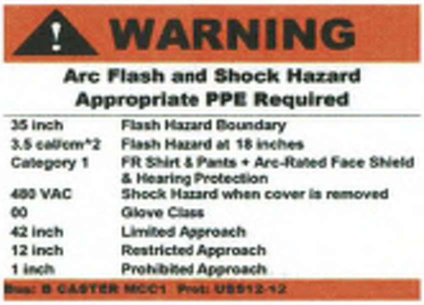
b) An arc flash hazard analysis shall not be required when all of the following conditions are met:

  I. Circuit is rated 240 V or less;

  II. Circuit is supplied by one transformer; and

  III. Transformer supplying circuit is rated less than 125 kva.

c) In many cases, the Arc Flash Boundary will be a greater distance than the Limited Approach Boundary. Shock Approach Boundaries and the Arc Flash Boundary are independent of each other.



WARNING

Arc Flash and Shock Hazard
Appropriate PPE Required

35 inch	Flash Hazard Boundary
3.5 cal/cm^2	Flash Hazard at 18 inches
Category 1	FR Shirt & Pants + Arc-Rated Face Shield & Hearing Protection
480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 inch	Limited Approach
12 inch	Restricted Approach
1 inch	Prohibited Approach

Bus: B CASTER MCC1 Prot: US512-12

d) The Arc Flash Boundary specifies the distance when the arc flash PPE is required. All parts of the body inside the Arc Flash Boundary shall be protected.

e) Non-melting natural fiber or arc rated (AR) underclothing in addition to any required PPE must be worn when within the Arc Flash Boundary. Acceptable under layer materials consist of cotton, silk, wool, rayon and non-stretching denim. However, non-melting fabric undergarments or socks that contain incidental amounts of elastic may be used.

f) The worker is responsible for visually inspecting the electrical specific PPE for damage or moderate contamination (e.g. flammable liquids on/in the cloth that will impair the protective qualities) prior to use and store it in a manner that prevents deterioration from physically damaging conditions (such as moisture, dust, or other deteriorating agents).

g) Protective arc flash PPE that becomes contaminated with grease, oil, flammable liquids, or combustible materials to the extent that the protective qualities are impaired shall not be used due to the increased potential for the clothing to continue to burn personnel in the event of an arc flash exposure.

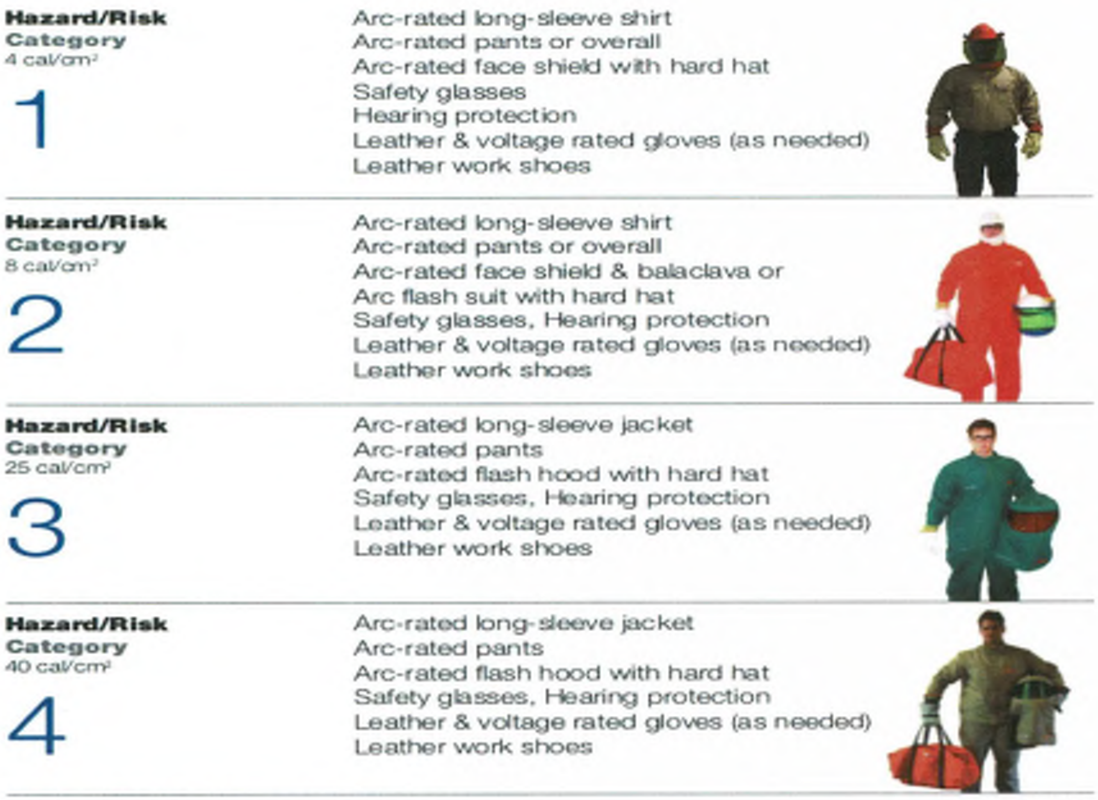
h) Garments worn as outer layers (e.g., jackets or rainwear) shall also be made from AR/FR material or removed prior to entering the Arc Flash Boundary.

i) HRC=1 requires the use of an arc rated face shield. Safety eye protection shall be worn under arc rated face shields or arc flash suit hoods. Additional illumination of the task area may be necessary when these types of arc protective face shields are used.

j) HRC=2 requires the use of an arc rated balaclava (head sock). Arc rated hood is permitted in lieu of head sock.

k) Employees are required to wear hearing protection whenever working within the arc flash boundary.

l) Leather footwear provides some arc flash protection to the feet and shall be used in all incident energy levels greater than 4 cal/cm2.



Hazard/Risk Category 4 cal/cm² 1	Arc-rated long-sleeve shirt Arc-rated pants or overall Arc-rated face shield with hard hat Safety glasses Hearing protection Leather & voltage rated gloves (as needed) Leather work shoes
Hazard/Risk Category 8 cal/cm² 2	Arc-rated long-sleeve shirt Arc-rated pants or overall Arc-rated face shield & balaclava or Arc flash suit with hard hat Safety glasses, Hearing protection Leather & voltage rated gloves (as needed) Leather work shoes
Hazard/Risk Category 25 cal/cm² 3	Arc-rated long-sleeve jacket Arc-rated pants Arc-rated flash hood with hard hat Safety glasses, Hearing protection Leather & voltage rated gloves (as needed) Leather work shoes
Hazard/Risk Category 40 cal/cm² 4	Arc-rated long-sleeve jacket Arc-rated pants Arc-rated flash hood with hard hat Safety glasses, Hearing protection Leather & voltage rated gloves (as needed) Leather work shoes

6. Wearing Of Conductive Articles.

Conductive articles of jewelry and clothing (such as watchbands, bracelets, rings, key chains, necklaces, cloth with conductive thread, metal headgear, or metal frame glasses) shall not be worn where they present an electrical contact hazard with exposed energized electrical conductors or circuit parts.

7. Tools.

a) Insulated hand tools shall be rated and designed for the voltages on which they are used. Insulated hand tools shall be protected from damage to the insulating material.

b) Qualified Persons shall use insulated hand tools when they are working inside the Restricted Approach Boundary of exposed energized electrical conductors or when the tool might make accidental contact with the electrical conductor.

c) Fuse-handling equipment that is insulated for the circuit voltage shall be used to remove or install a fuse if the fuse terminals are energized in addition to PPE dictated by the Hazard Warning Labels posted on electrical equipment.

d) Fiberglass-reinforced plastic rods and tubes used for live line tools (e.g. hot sticks) shall meet the requirements of ASTM F 711.

8. Reclosing Circuits after Protective Device Operation (breaker tripped).

a) If a circuit is de-energized by a circuit protective device (such as a circuit breaker), the circuit shall not be manually re-energized by an unqualified person until it has been determined by a Qualified Person that the equipment and circuit can be safely energized.

b) Exceptions:

   I. When it can be determined from the design of the circuit and the over-current devices involved that the operation of the device was caused by an overload rather than a fault condition, examination of the circuit by a Qualified Person shall not be required before the circuit is re-energized once. If the circuit trips again, only a Qualified Person can re-energize.

   II. When it can be determined that a power failure caused the trip, a Qualified Person need not be contacted to reset the equipment.

9. Qualified Persons Training.

a) Understand the specific electrical hazards to which they could be exposed;

b) Safety related work practices and procedures such as the Electrical Specific PPE Table and Hazard Warning Labels;

c) The skills necessary to determine the various approach distances;

d) Electrical hazards and possible injury;

e) In methods of release of victims from contact with exposed energized electrical conductors.

f) Specific electrical work methods and be able to recognize and avoid the electrical hazards;

g) Proper use of the applicable special precautionary techniques and PPE, including arc flash, insulating and shielding materials and insulated hand tools and testing equipment.

h) Selection and use of an appropriate voltage detector and the skills necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment;

i) The use of the Energized Electrical Work Permit.

NOTE: A worker who is undergoing on-the-job training and who in the course of such training has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those duties.

j) The training will be classroom, on-the-job, or both. The degree of training provided will be determined in accordance with the risk to the worker. The provided training will be documented.

10. Retraining.

Employees who are qualified workers shall receive periodic re-training at a minimum frequency of every three years to maintain an appropriate level of awareness.

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ELECTRICAL SAFETY REVIEW

1. What amount of electrical current can cause serious burns, respiratory distress or even death?

   A. 40 volts
   B. 5 milliamperes
   [✓ C. Less than 1 amp]
   D. None of the above answers are correct

2. There are lots of ways of preventing electrical shock. Which of the following are ways to prevent shock? (Circle all that are correct)

   [✓ A. Inspect cords for damaged insulation, missing ground prong and overheated plugs.]
   B. Use extension cords that are three wire and have a minimum gauge of 16.
   [✓ C. Ensure only authorized repairs are made to electrical cords such as weather tight plugs.]
   D. Work on or near unguarded energized electrical equipment without locking it out.
   [✓ E. Protecting cords that run through doorways, sharp edge metal and across roadways.]

3. Complete this sentence. OSHA requires a GFCI used for all electrical Hand tools
   ____.

4. An arc flash can occur by simply engaging or disengaging electrical disconnect switch gear or starter panel switches?

   [✓ A. True]
   B. False

5. High Voltage Overhead Line accidents can occur when?

   A. Working with mobile equipment that has extended reach.
   B. Working closer than 10 feet on 50,000 volts or less.
   C. Working on ladders or scaffolding.
   [✓ D. All the above]

6. Who is the person that is allowed to work on electrical power circuits?

   A. Only trained and qualified persons.

7. In order for a qualified person to work on energized electrical equipment, what must be considered? (Circle all that is correct)

   [✓ A. Can the work be performed de-energized]
   [✓ B. If energized work is needed, is it justified]
   [✓ C. Is an Electrical Work Permit required]
   [✓ D. What shock and arc flash PPE is needed to perform the work]
   [✓ E. What barriers or warning systems need to be installed]

LOCKOUT TAGOUT TRY
CONTROL OF HAZARDOUS ENERGY

1. Introduction.

Failure to lock, tag and try electrical equipment is one of the top 5 causes of all fatal workplace accidents.

2. Scope.

For the control of hazardous energy associated with machines, equipment, or processes that could cause injury to personnel.

3. Applies To.

a) Activities such as, erecting, installing, constructing, repairing, adjusting, internally inspecting, lubricating, unjamming, setting up, trouble-shooting, testing, cleaning, dismantling, servicing and maintaining machines, equipment or processes.

b) When placing any part of your body into an area on a machine or piece of equipment where the unexpected machinery start-up or release of stored energy could cause injury.

c) This includes removing of any guard, cover or shield.

DANGER
USE LOCKOUT BEFORE WORKING ON EQUIPMENT

d) It does not apply to work on cord and plug connected electric equipment which is controlled by unplugging the equipment from the energy source and the plug being under the control of the employee performing the servicing or maintenance.

4. Definition.

a) Affected Employee: An employee who operates the equipment. Affected employees may disable, shut down, or turn off machines or equipment. Note: Many facilities refer to these employees as Operators, Users or Equipment Owners.

b) Authorized Employee: An employee who locks out & tags out machines or equipment to perform servicing or maintenance.

c) Hazardous Energy:
   - I. Electrical (live or stored);
   - II. Mechanical (moving machinery parts, etc.);
   - III. Hydraulic (lifts, truck beds, jacks, cylinders, presses, etc.);
   - IV. Pneumatic (air pressure);
   - V. Chemical (corrosive, toxic, acidic, flammable whether in a solid, liquid or gas, etc.);
   - VI. Thermal (steam, hot chemical or liquids such as molten sulfur, extreme cold liquid or gases such as liquid nitrogen, etc.);
   - VII. Spring tension;
   - VIII. Lasers;
   - IX. Radioactive material;
   - X. Kinetic energy (mobile equipment including railcars)

WARNING
Explosion hazard.
Hot steam and liquid may escape when door is open.
Bleed off pressure before opening door.

5. Written Program Requirements.

a) Employers must have a written Lockout Tagout Program that includes:

- I. Written energy control procedures;
- II. Employee training; + Devices (Tags / Locks)
- III. Periodic inspections.

b) Facilities shall develop and document equipment specific lockout/tagout procedures that include:

- I. The specific steps for shutting down, isolating, blocking and securing equipment to control hazardous energy;
- II. The specific steps for the placement, removal and transfer of lockout devices and the responsibility for them; and
- III. The specific requirements for testing a machine to verify equipment isolation.
- IV. Procedures shall be posted or otherwise readily available for Authorized Employees to review and use.
- V. An equipment specific procedure is not required if all of the following exist:
  - A. No potential for stored or residual energy or re-accumulation of stored energy after shut down which could endanger employees;
  - B. Single energy source which can be readily identified and isolated; and
  - C. A single lockout device will achieve a locked out condition.

6. General Requirements.

a) Authorized Employees (those that are performing the servicing and applying lockout), must notify Affected Employees (Operators) prior to lockout/tagout and after the removal of lockout/tagout devices.

Note: many FPP facilities require a permit system to be completed prior to lockout. The permit is generally issued by the Operator or Equipment Owner. Example would be Safe Work Permit.

Note: in addition to the permit system, many facilities require a Job Safety Review such as a Pre-Job Risk Assessment to be documented prior to getting a permit and starting the task.

b) The Equipment or process will be properly shutdown, generally by the Affected Employees.

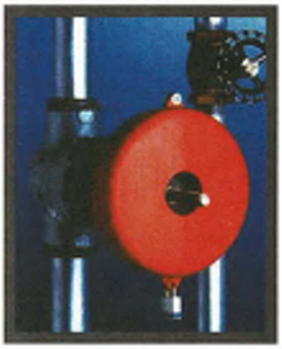
c) Each isolation device needed to control hazardous energy must be operated in manner to isolate the machine from the energy (close valves, open electrical disconnect switches).

Note: the act of opening or closing electrical disconnect switches could pose hazardous conditions. Only trained and authorized personnel should perform this. Insulate yourself from electrical power by:

- I. Wearing leather gloves and long sleeve natural fiber clothing. Many facilities require arc rated clothing to perform this task;
- II. Stand to side of disconnect device, not in front; and
- III. Avert eyes & face.

d) All energy isolating devices capable of being locked out, shall be locked by each Authorized Employee. See exemptions under the Tagout section.

- I. Locks shall be identified as to whom it belongs to.



II. Locks shall not be used for other purposes other than the control of hazardous energy.

III. Locks shall be standardized in at least one of the following criteria: color; shape; or size.

IV. Key must remain in the possession of the person it belongs to.

Note: some FPP facilities require the Operator (equipment owner) to place a lock (e.g., a blue lock) on the isolation devices first. Some facilities request that Authorized Employees including contractors use a specific color lock (e.g., yellow).

e) The use of push buttons, selector switches, and other control circuit type devices as energy isolating devices is prohibited.

f) Each lock should include a warning tag indicating the individuals doing the work.

Note: neither ANSI nor OSHA requires a tag with every lockout.

Note: many FPP facility programs do require a tag for each lock. Tags should include company name and employee name or ID.

g) Stored energy such as electrical capacitors, springs, elevator machine members, rotating flywheels, hydraulic systems and air, gas, steam or water pressure, etc. must also be dissipated or restrained by methods such as grounding, blocking, repositioning, bleeding down, etc.

h) Prior to starting work, the Authorized Employees shall verify that isolation and de-energization has been done.

Note: verification may be accomplished by testing circuitry, cycling, visually inspecting position, manually trying; monitoring movement or discharge; observing bleeds, gauges, indicators or other available means. Use of the technique(s) with the best degree of isolation assurance is preferred.

Note: when manually trying to start the machinery, if more than one start switch/button operates the machinery, than all must be tried. All Authorized Employees should be included in the verification or have a designated representative perform the verification.

i) Voltage testing is required to verify that electrical equipment has been de-energized when working on or near de-energized electrical components. Until the absence of voltage is verified, opening an electrical panel for testing is considered working on or near exposed live parts.

j) Work may begin. Remember some FPP facilities require a permit system that would require final approval by equipment owner or supervisor.

7. Tagout Requirements.

a) If an energy isolating device is not capable of being locked out, a tagout program shall be used.

b) When a tagout device is used on an energy isolating device, which is capable of being locked out, the user shall use additional protective means to provide an effective level of safety.

    I. Additional protective means shall include but are not limited to the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle, etc.

c) Tags shall be:
    II. Standardized;
    III. Durable
        A. Constructed and printed so that exposure to weather conditions will not cause the tag to deteriorate or the message to become illegible.
        B. Shall not deteriorate when used in corrosive environments.
    IV. Tag attachment be non-reusable, self-locking, non-releasable and have a minimum breaking strength of no less than 50 pounds such as a plastic wrap tie.

Note: most of the equipment operated by an electric plug such as tools in a fabrication shop and equipment started by batteries and a key switch such as mobile equipment have the capability of being locked out.

d) Mobile equipment with a key start switch must have the key removed and a tagged placed on the equipment in a highly visible location. Each person working on the equipment should place their tag on the equipment. Additionally, the equipment should be chocked to prevent movement.

Note: many FPP facilities have implemented the policy to remove the negative battery cable and attach a tag to the cable. A plug lockout device may also be required so a lock can physically be applied.

8. Lockout Removal.

a) Before lockout devices are removed and energy restored:
    I. Each lock must be removed by the employee who applied it.
    II. Ensure that tools and nonessential materials have been removed.
    III. Ensure guards, covers or shields are put back in place.
b) Notify the Affected Employee that locks were removed.
c) If the task is not completed but the shift has ended, remember to remove your lock.

10. Group Lockout.

a) If multiple pieces of equipment are being locked out and or, work is performed by a crew, craft, department; a group lock box or cabinet can be used.

b) One primary authorized employee performs lockout on the equipment, machinery or process and places the keys into the box or cabinet.

Note: this is generally performed by the operator or equipment owner.

c) Each Authorized Employee or the designated representative must verify that all required equipment has been locked out.

d) Each Authorized Employee must apply his/her personal lock to the box or cabinet.

Note: some FPP facilities require the Affected Employee (equipment owner) place a lockout device on the box or cabinet (e.g., a custodian lock)

Note: it is recommended that a means be established that will clearly indicate what isolation devices are part of the group lockout system. A permit or list is often used to document each isolation device.

11. Training.

a) Initial training must be provided to all Authorized Employees and Affected Employees prior to performing service and maintenance tasks or being potentially exposed to hazardous energy.

b) Retraining shall be provided whenever there is a change in job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

c) Additional training shall also be conducted whenever an audit reveals, or whenever the authorized individual's knowledge of the energy control procedures is inadequate or inconsistent with the requirements.

LOCKOUT TAGOUT REVIEW

1. Lockout Tagout is intended to control of hazardous energy associated with machines, equipment, or processes. Which of the following activities does this apply to? (Circle all that are correct)

   A. Loading and unloading supplies
   [✓ B. Lubricating]
   [✓ C. Servicing]
   [✓ D. Removing a guard]
   [✓ E. Adjusting]

2. What are the three things that employers programs must include?

   A. written energy control proc.
   B. Employee training
   C. Periodic Inspections.

3. Complete this sentence. The Affected Employees (operators) must be notified prior to performing lockout tagout of equipment or processes.

4. Many FPP facilities require a Job Safety Review performed after getting the Safe Work Permit?

   A. True
   [✓ B. False] Before.

5. Locks used by the Authorized Employee shall?

   A. Have several keys available to more than one employee.
   B. Be used for other purposes other than the control of hazardous energy.
   C. Be standardized in at least one of the following criteria: Age; brand; or size.
   [✓ D. Include a tag with employee name and company name if used at a FPP facility.]

6. Provide three examples of stored energy that must be either bleed, blocked, grounded or repositioned?

   A. Electrical Capacitors
   B. Springs ; elevator machine members, rotating flywheels
   C. Hydraulic systems

7. Verification that isolation and de-energization has been done can be done by all the authorized employees or by a designated representative.

   [✓ A. True]
   B. False

HAND TOOL SAFETY

1. Introduction.

a. Tools are such a common part of our lives that it is difficult to remember they pose significant hazards. These tools have the potential for causing severe injuries when used or maintained improperly. Special attention toward hand tool safety is necessary to reduce or eliminate these hazards. Through training, workers learn to recognize the hazards and the safety precautions necessary to minimize or eliminate those hazards.

2. Basic Hand Tool Safety.

a. Following these five basic safety rules can minimize hazards and prevent injuries:
   - I. Use the right tool for the job.
   - II. Inspect each tool before using it.
   - III. Keep all tools in good working condition.
   - IV. Use and operate all tools per the manufacturer's instructions.
   - V. Wear the proper personal protective equipment for the tool you are using and the work being performed.

b. Using hand tools improperly or in a manner not designed for the work or task being performed is just one of the greatest hazards posed by hand tools.

3. Defective Tools.

a. Many injuries also occur when using a defective tool.

b. This happens when:
   - I. Tools used are broken or severely worn.
   - II. Tools are improperly maintained.
   - III. Preventive maintenance is not performed on tools.

c. Broken or modified hand tools are never to be used.
   - I. Wooden and fiberglass tool handles should never be covered with tape. Replace if splits or cracks are observed during inspection.
   - II. Loose handles can slip or cause the tool head to fly off. They should be repaired or replaced.
   - III. Striking tools such as punches or chisels that have mushrooming heads could cause the head to shatter on impact.
   - IV. Cutting tools that are dull require more force to use, creating a potential to slip, loose balance or cut yourself or someone near you.
   - V. Wrench that have rounded or widen should be replaced. The wrench could slip causing injury.
   - VI. Never expose tools to excessive heat or bend to change their shape.
   - VII. Never use a worn or damaged tool. Tag it out to prevent others from using.

4. Wrenches.

a. Wrench handles are designed to provide the maximum leverage that can be safely applied.

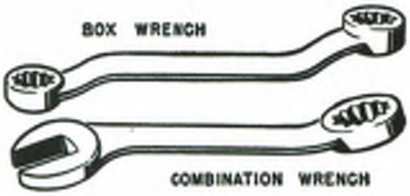
b. Never use a pipe extension or other form of "cheater" to increase the leverage of any wrench.

c. Adjustable wrenches are designed to apply the force against the fixed jaw; never apply force against the moveable jaw of an adjustable wrench.

d. Pulling on a wrench handle and adjusting your stance helps prevent a fall if sudden release occurs.

e. Only use wrenches that have been bent by the manufacturer.

f. Never strike a wrench with a hammer unless it is designed for that purpose such as a knocker wrench.



5. Striking Tools.

a. Never strike hardened surfaces against each other (e.g. using a hammer to hit another hammer or a bearing races).

b. Never use a hammer with a loose or damaged handle.

c. Properly trimming the mushroomed head of a punch or chisel by grinding will make it safe to use. If the tool cannot be repaired it should be removed from service.

d. Never use a chipped hammer head.

e. Body and hand placement is critical to help prevent injuries.

f. Many facilities require impact gloves worn if the hand could be contacted.

g. Many facilities require a face shield worn when striking objects that have the potential to generate a flying projectile.

6. Screwdrivers.

a. Use screwdrivers only for their intended purpose: tightening, loosening or adjusting screws.

b. A screwdriver should never be used as a pry bar; overstressing the tip could cause it to break.

c. Never use a screwdriver as a punch or chisel.

d. Do not use a screwdriver with a defective handle or broken tip.

e. Do not hold an object in your hand and use a screwdriver to tighten, loosen or adjust a screw. This action could result in the screwdriver slipping and injuring your hand.

f. Never carry a screwdriver in your pocket.

7. Cutting Tool Safety.

a. Many FPP facilities have implemented specific procedures for cutting tools. The following is information pertaining to those requirements.

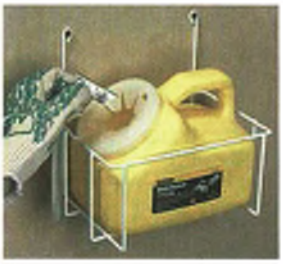
b. This does not apply to kitchen knives used in personal food preparation and consumption.

c. Cutting tools must only be used to perform tasks for which they were designed.

d. Discard all dull or damaged knives or saw blades.

e. When changing blades, cut resistant rated 5 gloves shall be worn.

f. While disposing of used cutting blades the blades should be placed in containers to prevent a cut exposure to the garbage handler.



TOC

g. Cutting Techniques:

I. Secure the item which you are cutting in order to minimize having to make an awkward cut. Preferably use clamps or vise versus holding with your hand.

II. Hands and other body parts, or other persons should not in the "line of fire." Cut away from your body.

III. Never bend or apply side loads to blades or use them to open cans, loosen screws or pry.

IV. A cut resistant rated 5 glove is required when using any cutting knife type tool. A cut resistant rated 4 sleeve may also be required for knives and saws.

h. Prohibited Cutting Tools:

I. Certain cutting tools are prohibited at some FPP facilities.

II. Snap off blade knives, unguarded locking utility knives, blades on multi-tools, pocket knives, hawkbill or hook knives.

III. If there is a task where one of these is the only one to accomplish the job, then a written Task Risk Assessment shall be completed.

IV. Approval maybe needed from senior management and by the safety department.

Snap off bladed knives

Unguarded locked blade utility knives

Blades of multi-tools

Pocket knives

Hawkbill/hook knives

i. Approved Cutting Tools:

I. Auto Retracting" or "Auto Guarded blade knives

II. Concealed Blade Cutter

III. Wire Cutter/Stripper

IV. Electrical Cable Cutter/Stripper

V. Side cutter

VI. Concealed Blade conveyor belt cutter

VII. Hand saws for the specific task

8. Electrical Tools.

a. Never carry a power tool by the cord.

b. Never yank a cord to disconnect it from the receptacle.

c. Disconnect tools before servicing, or changing accessories such as blades, bits, and cutters.

d. Use a GFCI with all hand held electrical power tools.

e. Tools equipped with safety guards must never be removed when the tool is energized or in operation.

f. Safety guards and covers may be removed to service a tool and must be replaced before use.

g. Many FPP facilities prohibit using lock-on power control switches for hand held power tools. A momentary-contact control switch that allows the tool to operate only when the operator depresses should be used.

h. Circular saws and chain saws shall not be equipped with devices which lock-on the operating controls.

i. A clamp or vise should be used to secure work materials to prevent them from slipping.

j. Avoid wearing loose clothing and jewelry that can become caught in moving parts of power tools.

TOC

ABRASIVE TOOL SAFETY

1. Choosing the Correct Grinding Wheel:

a. Ensure the wheel is designed for the machine's size, speed and the material of construction of the work piece.

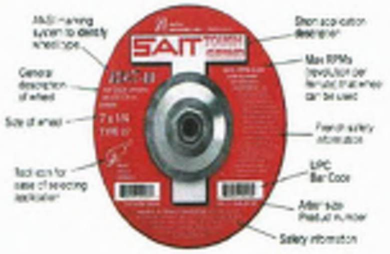
b. Grinding disks are made from various types of abrasive materials. They are classified according to weight, size, arbor hole size (hole in the middle) and Rotations Per Minute (RPM) and material to be used on. This information can be found on the disk.

c. Grinding disks are to be used for GRINDING only; DO NOT use to cut material.

d. Cutting blades are classified according to size, arbor hole size and thickness. This is found on the blades.

e. Cutting blades are used for CUTTING only. DO NOT grind with them. Use only the edge.

f. Never use a wheel that is not rated for the speed of the tool.


General description of wheel
Size of wheel
Tool icon for ease of selecting application
Short application descriptor
Max RPMs (revolution per minute) that wheel can be used
French safety information
UPC Bar Code
Product number
Safety information
SAIT

2. Mounting the Wheel:

a. Disconnect power source before adjusting, oiling or changing accessories.

b. Ensure wheel maximum speed is higher than grinder maximum speed.

c. Inspect wheel for cracks or flaws.

d. Perform a "ring test" on wheels prior to mounting (not applicable to all type wheels or other attachments and accessories).

   I. Gently tap a dry clean wheel with a light nonmetallic tool—perhaps screwdriver handle for light wheels or wooden mallet for heavier ones.

   II. The tap should produce a clear metallic "ping." If the sound is more like a dull thud, the wheel is probably cracked and shouldn't be used.

e. Ensure guard is replaced in the appropriate position.

f. After mounting wheel or brush and replacing the guard, stand to the side and allow a one minute run-up at no load.

3. Guarding:

a. Grinders come equipped with a wheel guard that must remain in place at all times to protect the operator.

b. Portable cylindrical grinders:

   I. "Proper" placement of tool guard may vary. Handles can be moved on some angle grinders. The guard must be between the wheel and the handle.

   II. Wheels should not exceed more than 180 degrees of side exposure.

c. Bench and pedestal grinders:

   I. Have a guard covering the spindle end, nut, and flange.

   II. Tongue guard distance from the surface of wheel shall never exceed 1/4 inch.

   III. Work rests distance from the surface of wheel shall never exceed 1/8 inch.

4. Safe Use Procedures:

a. Always inspect before using.

b. Wear safety glasses with side shields and a face shield even if the bench grinder comes with built in shields.

c. Stand to the side of bench grinders and allow grinder to come to full speed.

d. Leather gloves to protect your hands from flying particles and sharp edges created during the grinding operation, as well as the edge of the wheel itself. Gloves are not recommended when working close to the wheel of a bench grinder. Loose clothing and dangling jewelry is not allowed.

e. Hearing protection is required.

f. Some grinding wheels are not designed to grind non-ferrous materials such as aluminum, brass or copper. Special wheels are needed for these metals.

g. Allow grinder to come to complete stop before removing PPE or setting tool down.

h. Secure work with clamps or a vise, freeing both hands to operate the tool.

i. Some facilities prohibit the use of angle grinders with cutting disc. Determine if other tools can be used to safely cut item. If an angle grinder is the only tool, you may need special authorization.

j. Many facilities prohibit the use of angle grinders without the handle attached.

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PNEUMATIC TOOL SAFETY

1. Use of Compressed Air.

a. At no time shall compressed air be directed toward a person. When compressed air is used, all necessary precautions shall be taken to protect persons from injury.

b. A manual master quick-close type air valve shall be installed on all pneumatic-powered equipment if there is a hazard of uncontrolled movement when the air supply is activated. The valve shall be closed except when the equipment is being operated.

c. If an air hose is more than ½ inch in diameter, a positive pressure valve must be installed at the source of the air supply to shut off the air automatically in case of hose breakage.

2. Safe Use Procedures.

a. Use properly rated hoses and connections for all pneumatic tools.

b. Before making or breaking any air connection, always turn off the air supply unless equipped with a quick disconnect. Never kink the hose as a shortcut.

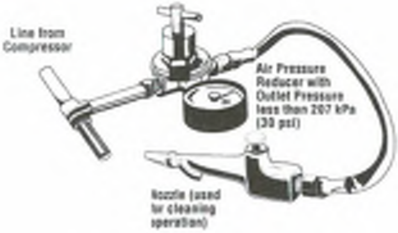
c. Protect the air hose from damage. Move it out of the way of vehicles so that it isn't run over. Additionally, make sure air hoses do not present a tripping hazard.

d. An unconnected high-pressure hose is a flogging hazard to workers. All hose connections on pneumatic power tools, including the one at the tool, must be secured by a positive locking device to prevent accidental disconnection.

e. Pneumatic hand tools should be equipped with a trigger that will automatically shut off the tool when you remove your finger or hand. This is sometimes called a deadman switch.

f. Wear safety glasses with side shields and hearing protection. Some tools would also require a face shield and leather gloves during use.

3. Tool Specific Procedures.


Line from Compressor
Air Pressure Reducer with Outlet Pressure less than 207 kPa (30 psi)
Nozzle (used for cleaning operation)

a. Air Blower/Guns

   I. Do not use compressed air to blow your clothes.

   II. When used for cleaning equipment, the nozzle pressure must remain at or below 30 psi.

b. Pneumatic tools that shoot nails, rivets, or staples and operate at pressures more than 100 psi, must be equipped with a device to prevent fasteners from being accidentally ejected.

c. Impact Tools

   I. Safety clips or retainers shall be installed on pneumatic impact (percussion) tools to prevent attachments from being expelled.

POWDER-ACTUATED TOOL SAFETY

1. Introduction.

a. Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions.

2. Safety Operating Practices.

a. Only properly trained employees may operate powder-actuated tools.

b. Before operating a powder-actuated tool, it should be inspected to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

c. Never load unless it is to be used immediately.

d. A loaded tool is never left unattended.

e. Never point toward a person.

f. Eye and face protection must always be worn.

HYDRAULIC TOOL SAFETY

1. Safe Operating Practices.

a. The fluid used in hydraulic power tools should be an approved fire-resistant fluid.

b. The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

c. Hoses, seals, and valves are to be checked before and after each use.

d. Never operate a hydraulic tool with defective hoses, seals, or valves.

e. You must guard yourself and others from exposure to flying debris should the parts that you are pressing or pulling fail under the force.

TOC

HYDRAULIC JACK SAFETY

1. Introduction.

a. Hydraulic jacks come in a variety of styles, shapes, and sizes. Select a jack suited for the job.

2. Safety Operating Practices.

a. The manufacturer's maximum load limit is to be permanently marked in a prominent place on the jack and is not to be exceeded at any time.

b. The base should rests on a firm level surface.

c. The jack head should bear against a level surface.

d. All jacks should be inspected before use and lubricated regularly.

e. Never place any part of your body under a load that has been lifted by a hydraulic jack, until it has been properly blocked by a rated support.

f. If a jack is subjected to an abnormal load or shock, it should be thoroughly examined to make sure it has not been damaged.

GAS POWERED TOOL SAFETY

1. Introduction.

a. Gas powered tools are fueled by gasoline and include chain saws, lawn mowers and trimmers. The most serious hazards with gasoline-powered tools come from fuel vapors that can burn or explode, or exhaust that gives off dangerous fumes.

2. Safety Operating Practices.

a. Before refueling gasoline-powered tools, shut down the engine and allow it to cool to prevent accidental ignition of fuel vapors.

b. Gasoline-powered tools must never be used inside a closed or poorly ventilated area. Forced ventilation must be used when working inside a poorly ventilated work area.

c. Always stay clear of all moving parts on a gasoline-powered tool.

WATER JET TOOL SAFETY

1. Introduction.

a. Hydro-blasting activities require a trained operator familiar with the identification of high-pressure pumps, metal fittings, hoses, guns, and accessories.

2. Safety Operating Practices.

a. Modification of waterjet (hydro-blast) equipment is not allowed without the written approval of the manufacturer.

b. Serious injuries may result from the misuse of waterjet equipment or the use of improper fittings, hoses, or attachments.

c. Waterjet operators shall wear proper head, eye, face, ear, hand, feet, and body protection at all times during blasting procedures.

d. The area where waterjet tools are used must be barricaded, as necessary, to isolate the work area.

e. No persons, other than those having immediate responsibilities, shall enter the waterjet work area during the time barricading is in place. They can enter only after:

  I. Gaining the attention of the waterjet operator or a team member and,

  II. Receive authorization from the operator or team member before entering.

f. The Supervisor in charge of the waterjet work is responsible for the following:

  I. Identifying potential hazards in the work area and implementing appropriate safeguards.

  II. Implementing environmental controls, if necessary, to control hazardous material runoff.

  III. Barricading or implementing a lock out and tag procedure to secure the area or the equipment being cleaned.

  IV. Verifying that proper personal protective equipment (PPE) has been selected in advance and is available for use.

TOC

FALLING OBJECT PROTECTION

1. Introduction.

Many facilities have developed programs to reduce the potential of falling objects. They are given various titles, but one popular name is Stop The Drop. Falling object examples are hand tools, steel beams, plywood, water bottles, impact gun, torque wrench, PVC pipe, fiberglass panels, nuts/bolts, debris, cell phones, scaffold tubes, hardhats, etc.

Remember, PPE is generally the last form of protection from hazards. If the job can be performed on the ground or lower levels, than you have eliminated the falling object potential. Many times this is not feasible. The existing toeboards and guardrail are not adequate and persons may still need to enter the area below.

Falling objects are created when setting up the job, when moving material, when loosening or installing material, when raising material. Poor housekeeping, hot work, sandblasting, working from scaffolding or aerial lifts all have the potential for to cause falling object hazards.

2. Barricades.

a) Standard barricades (red tape) may be used alone as a single level of protection ONLY when the overhead work area is above a remote area where NO employees/contractors are normally expected to be present.

b) When workers "could" possibly enter under the elevated work area, then an exclusion zone underneath the elevated work area shall have barricades that are strictly enforce. This can be done with either a fence type barrier or barricade tape with a dedicated attendant.

   I. Attendant must have radio control with work overhead so if entry is needed, approval can be made or job can be stopped.

c) When neither of above apply and persons must enter the area where overhead work is being performed, engineering control should be used.

3. Controls.

a) Raise toeboards to prevent objects from falling over toe board.
b) Barriers to prevent objects from falling through railing.
c) Matting to prevent small objects from falling through grating.
d) Rated tool buckets with covers.
e) Covered walkways.
f) Tool restraints.
g) Debris catch nets.
h) Trash chutes

TOC

TOOL SAFETY REVIEW

1. What basic safety rules can minimize tool hazards and prevent injuries? (Finish the sentence)

A. Use the right tool for the job.
B. Inspect each tool before using it.
C. Never use a broken / defective tool.
D. All tools should be kept in good working. condition.
E. Using tools improperly is one of the greatest hazards associated with tools.

2. Using pipe extensions on a wrench or using a modified wrench is acceptable if you wear PPE and you use extreme caution?

A. True
[✓ B. False]

3. Which of the following is a safety practice concerning striking tools?

A. Never strike a hardened surface such as a hammer against a softer surface.
B. A hammer with a split handle can be used if you wrap it with tape.
C. Trimming the mushroomed head of a punch or chisel by grinding is prohibited.
[✓ D. Many FPP facilities require a face shield worn and impact gloves when using striking tools.]

4. Many FPP facilities prohibit certain cutting tools. Which of the following would require special permission to use? (Circle all that are correct)

[✓ A. Unguarded locking utility knives]
[✓ B. Auto retracting razor knife]
[✓ C. Blades on multi-tools]
[✓ D. Pocket knives]
E. Hand saw

5. Using an angle grinder with a cutting disc requires special approval at most FPP facilities.

[✓ A. True]
B. False

6. Describe types of engineering controls that can be used to prevent falling objects. (Finish the sentence)

A. Use tool restraints (Lanyard).
B. Rated tool buckets with covers.
C. Install barriers on grated work surface to prevent small objects from falling through.
D. Raise toe boards to prevent objects from falling over.

TOC

LINE AND EQUIPMENT OPENING

1. Definitions.

a) Line & Equipment Opening: The act of opening of a vessel, line, or pipe that contains, might contain, or has previously contained a hazardous material, inert gas, or any fluid or gas at a volume, pressure or temperature capable of causing an injury.

b) Line Opening Includes:

- I. Removing a flange;
- II. Removing a valve or pump;
- III. Removing a plug;
- IV. Cutting or drilling into line or equipment;
- V. Installing or removing a blind or blank;
- VI. The act of opening begins with loosening of the first bolt or other securing device.

2. Hazardous Work or Line Opening Permit.

a) Before opening any process equipment or piping system that may pose a hazard, a Hazardous Work / Line Opening permit must be obtained by the supervisor of the employees involved in opening.

b) Facility personnel will be able to supply the supervisor with the permit.

c) The permit is used to inform all personnel involved with the job of the hazards and to implement controls to minimize known and potential hazards.

d) Facility personnel must be contacted before opening any piping system or process equipment.

e) Do not open any process equipment or piping system until you fully understand the hazards.

3. Materials Requiring Hazardous Work Permit.

a) The following list requires the use of a Hazardous Work / Line Opening Permit prior to the entry or opening of the system where the material may be, or has been, present. This list is not exhaustive.

- I. Ammonia;
- II. Caustic;
- III. Condensate;
- IV. Fuel;
- V. Phosphoric Acid;
- VI. Steam;
- VII. Sulfur;
- VIII. Sulfuric Acid;

b) Other materials used in plant systems may require the use of a Hazardous Work / Line Opening Permit prior to opening equipment or a piping system.

4. Piping Isolation.

a) There are many ways to isolate a line or equipment before opening. Several factors determine which type of isolation method should be used:

  I. The hazard level of the chemical;

  II. Potential pressure remaining in the line;

  III. Body position during opening.

b) Many FPP facilities have written procedures that describe what isolation method that should be used. Using the most protective method should always be used when feasible.

c) Isolation methods include:

  I. Double block and bleed (two valves on upstream side are closed and locked along with a drain valve between the two valves opened and locked).

  II. Single valve closed and locked along with the pump shut down and locked out.

  III. Single valve closed and locked but no pump shut down.

  IV. Installing a blind or blank in the line is a very effective isolation method, but the physical task of installing the blind or blank is a form of line opening.

5. Personal Protection Equipment (PPE).

a) The PPE required when opening any process equipment or piping system will also vary due to the chemical involved, line pressure, body position, and which isolation method was used.

b) Most facility programs have detailed list or matrix on the type of PPE required. PPE may include:

  I. Acid suits

    A. jacket

    B. pants

    C. Acid hood

  II. Acid shroud

  III. Face shield with safety glasses or goggles (for most chemical splash or spray hazards, goggles are required)

  IV. Full face or half mask respirator if there is a potential to exceed the PEL

  V. Chemical resistant gloves

  VI. Rubber boots

  VII. Leather jacket & gloves for certain thermal hazards

  VIII. Hard hat

c) The supervisor of the persons who are going to open the process equipment or piping system must ensure that each person involved is trained in the use of all PPE that is to be used.

d) Anyone in the hazardous area of a job must wear appropriate PPE, including any supervisor.

6. OPENING PROCESS EQUIPMENT OR PIPING SYSTEMS

a) The following is a list of precautions that may be required to be taken before the opening of process equipment or piping system:

- I. Valves Closed, locked and tagged out;
- II. Pumps shut down and locked;
- III. De-pressurized;
- IV. Drained;
- V. Purged with inert material;
- VI. Washing or flushing with water;
- VII. An adequate water supply available at the site to capture any spills or release;
- VIII. Barricades used to restrict access to the area;
- IX. Safety shower / eye wash located and tested;
- X. Assign a Safety Watch to prevent others from entering and if needed, provide help if an accidental release occurs;
- XI. Emergency evacuation plans made and explained to employees.

b) Facility personnel assigned to the project and the employees supervisor shall make a thorough inspection of the equipment and/or piping system to ensure that all the in plant safety procedures are followed.

c) Facility personnel and the supervisor must ensure that every person working with a hazardous material or in a process area be aware of the dangers involved at the site location.

7. Safety Practices.

a) Personal Positioning:

- I. Do not allow anyone to stand in front of a door or flange that is being opened on process equipment or a piping system.
- II. Always loosen bolts on the opposite side of flanges from where you are located.
- III. Never stand below the line being opened.

b) Always assume that the hazardous material could still be in the line before opening, even if you have a gauge or an open drain. The gauge may not be working and the drain may be plugged.

c) When working in pipe racks special care must be utilized:

- I. Do not rupture other piping systems while rigging, welding, or performing other tasks; and
- II. Do not to push, pull or rig to other pipes in a pipe rack.

Don't take chances! When in doubt, ask for help!

LINE AND EQUIPMENT OPENING REVIEW

1. Finish this sentence. The act of opening of a vessel, line, or pipe that contains, might contain, or has Previously contained a hazardous material.

2. Line or equipment opening includes:

   A. Removing a flange, valve or pump
   B. Removing a plug
   C. Cutting or drilling into line or equipment
   D. Installing or removing a blind or blank
   [✓ E. All of the above answers are correct]

3. What must be obtained from the facility before opening any process equipment or piping system that may pose a hazard?

   A. Safe work Permit / Line opening Permit.

4. Which of the following would require a Line Opening Permit? (Circle all that are correct)

   [✓ A. Potable water]
   [✓ B. Pressurized fluids]
   [✓ C. Condensate]
   [✓ D. Fuel]
   [✓ E. Acids]
   [✓ F. Hot gases or liquids]

5. What factors determine the type and level of PPE required when opening any process equipment or piping system. (Finish each sentence)

   A. Chemical involved.
   B. Line Pressure.
   C. Body position.
   D. Isolation method used.

6. Always assume that the hazardous material could still be in the line before opening, even if you have a gauge or an open drain.

   [✓ A. True]
   B. False

Isolation
Pressure
Venting
Draining

HOT WORK

1. Introduction.

a) This standard is designed to prevent injury and loss of property from fire or explosion as a result of hot work activities such as welding, brazing, soldering, heat treating, grinding and other similar application producing a spark, flame or heat. Cutting and welding are the most dangerous forms of hot work. In hot work fires, the most common items first ignited are:

  I. 76% of hot work fires are attributed to being too close to combustibles such as wood, paper, cloth, and plastic.

  II. Most hot work fires occur during lunch, breaks and shift changes.

b) Relatively few fires occur at permanent workstations specifically designed for hot work, such as welding benches. Most fires start when workers use portable equipment for maintenance, alterations or repairs where conditions or the environment are not adequately designed to protect against ignition sources.

2. Definition.

a) **Hot Work:** Operations including flame or plasma cutting, welding, brazing, soldering, grinding, thermal spraying, installation of torch-applied roof systems, powder-actuated tools, hot riveting and all other similar applications producing a spark, flame, or heat, or similar operations that are capable of initiating fires or explosion.

Note: Many FPP facilities include other tasks as hot work such as sand blasting or cutting/drilling with a saw/drill when used on piping or container that may contain combustible or flammable material.

b) **Fire Watch:** A trained and authorized person posted at the hot work job site who remains there for the duration of the job and beyond as required by the hot work permit. This individual is also to provide assistance with fire control, communication and inspection of the affected area.

c) **Prohibited Hot Work Areas:**

  I. In sprinklered buildings while such protection is impaired, unless an alternative and appropriate means of fire protection is provided.

  II. In the presence of explosive atmospheres (i.e., where mixtures of air with flammable gases, vapors, liquids or dusts exist).

  III. In the presence of uncleansed or improperly prepared drums, tanks or other containers or equipment that have contained materials that could develop explosive atmospheres.

  IV. In areas with an accumulation of combustible dusts that might become airborne or develop an explosive atmosphere.

  V. In areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur.

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3. Hot Work Permit.

HOT WORK PERMIT

THIS PERMIT IS GOOD FOR 12 HOURS ONLY!

a) For anyone to perform hot work, he/she is required to obtain a Hot Work Permit.

   I. The permit will only be valid for one shift up to 12 hours in duration or until completion of the job, whichever is sooner.

   II. Shall be issued for one hot work operation and cannot be transferred to another location. Each new job will require a new permit.

   III. Hot work permits must be approved and signed before hot work can begin. Signing the hot work permit must not be done until all fire protection and prevention procedures are applied. Check with the facility representative to determine who is responsible for final approval.

b) Many FPP facilities have exceptions to issuing a Hot Work Permit which may include:

   I. Maintenance shops and fabrication shops or other areas that have been evaluated and are Designated Hot Work zones;

4. Prior to Hot Work.

a) Several tasks will be performed prior to hot work. These include, but are not limited to:

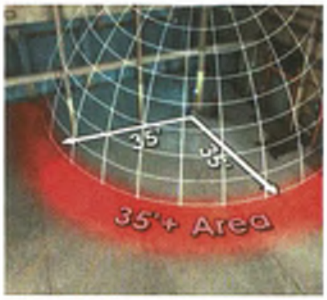
b) Remove all combustible and flammable materials within a 35 foot radius of the hot work area.

   I. Flammable materials include flammable liquids, gases, vapors, dust, etc.

   II. Combustible materials include liquids such as oils, solvents and fuels or solids such as insulation, building material, grass, rubber, conveyors, dried sulfur, grease, etc.

c) If all fire hazards cannot be removed or hot work relocation is impractical, then appropriate shielding or covers shall be provided to prevent sparks, slag, or heat from igniting fire hazards.

d) Welding blankets, curtains or pads must be large enough and tight enough to keep sparks from going around or under the barrier. Welding blankets, curtains and pads are required to be listed or approved by ANSI/FM 4950, or the equivalent. Remove from service older style (not listed or approved) blankets, curtains and pads



e) When surveying the 35 foot radius, look for:

   I. Openings or cracks in walls, floors, ducts or shafts.

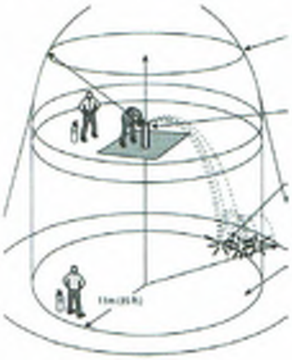
   II. Walls, partitions, ceilings, or roofs of combustible construction.

   III. Floors of loose combustible debris or if floors are made of combustible material.

   IV. Conveyor systems that may carry sparks of slag to other areas.

   V. Combustibles on the other side of walls, ceilings, etc., that could be ignited by heat, and move them or provide a fire watch.

f) Some FPP facilities have additional requirements when performing hot work above the lower level. These include:



   I. Relocate combustible materials a minimum of 50 feet from the hot work area, or properly protect with approved blankets, curtains or pads.
   II. Non-flammable decking/mats, fire blankets, etc. shall be positioned to prevent small objects, sparks and slag from falling.

g) Hot work on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.

h) Personnel working in the immediate area where hot work operations are taking place shall be suitably protected against heat, sparks, slag and radiant light. Shielding must be used when welding to protect eyes of other nearby employees.

i) The appropriate type of fully charged and operable fire extinguishers shall be immediately available in the hot work area.

j) Verify that there are no explosive atmospheres that might be present and ignited, such as when cutting empty drums, piping, vessels, pump housings, etc. Using a gas detector is required.

k) Mark the area using caution tape or warning barrier as to warn nearby personnel of the danger. Some FPP facilities require the caution tape to be tagged with date, name of person and reason for the warning.

l) Perform safety check on the condition of the welding & cutting equipment.

m) Verify proper personal protective equipment is being used and it is in good condition.

5. Fire Watch.

a) A fire watch is necessary if hot work is performed in locations where significant fires could develop or if any of the following conditions exist:

   I. Combustible materials are located within 35 feet.
   II. Combustible materials more than 35 feet away but are easily ignited by sparks.
   III. Wall, floor or other opening exists within 35 feet, which expose combustibles.
   IV. Combustible materials are adjacent to partitions and are likely to be ignited by conduction or radiation.

Note: Many FPP facilities require a fire watch anytime a hot work permit is issued.

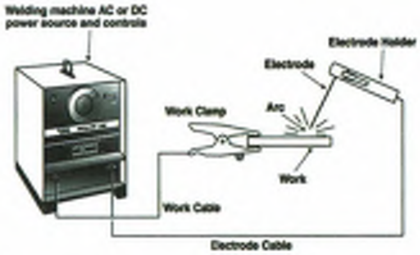
b) More than one fire watch should be required if combustible materials could be ignited by hot work that cannot be directly observed by the initial fire watch (i.e., through walls, ceilings or at lower levels).

c) Specific duties and responsibilities of a fire watch include:

   I. Watch for fires, smoldering material or other signs of combustion.
   II. Be aware of the inherent hazards of the work site and of the hot work.
   III. Ensure that safe conditions are maintained during hot work operations and stop the hot work operations if unsafe conditions develop.
   IV. Have fire-extinguishing equipment readily available and be trained in its use.
   V. Extinguish fires when they are in the early stage. If the fire is beyond the capacity of the equipment, sound the alarm immediately.
   VI. Be familiar with facilities procedures for sounding an alarm in the event of a fire.
   VII. Fire watch must be maintained for at least 30 minutes after completion of work.

Note: Many FPP facilities have expanded the fire watch to at least 60 minutes after completion of hot work. In addition to the first 60 minutes, an additional fire watch from 1 to 3 hours is required where the ignition of combustibles cannot be directly observed.

6. Welding Requirements.



a) Welders must inspect the power and ground leads each day to see that they are in good condition and that insulation is not broken. Duct tape is not acceptable to repair cuts on the welding cables. Use only approved connectors to make repairs.

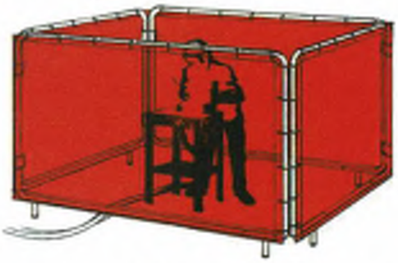
b) Repairs are prohibited within 10 feet from the electrode holder.

c) Never use electrode holders or ground clamps with defective jaws.

d) Ground clamps should be securely placed near the welding area to reduce the potential of electrical shock if any of the metal surface was contacted.

e) Never weld when wearing wet gloves or wet shoes.

f) Remove combustibles from pockets, especially matches and butane lighters.



g) Welders must set up shields when working in commonly used areas or high traffic areas to protect adjacent workers from the flash of an arc.

h) Welding or cutting on materials coated with lead, fluorides, cadmium, beryllium, mercury, zinc, galvanized metal or stainless steel requires special considerations.

i) Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, shall not be used as a ground return.

j) Keep your head out of the fumes. Use enough ventilation at the arc to keep fumes and gases from your breathing zone.

k) PPE should include welding helmet and safety glasses with side shield, non-synthetic flame retardant long sleeve shirt, cuff less pants, high boots and the appropriate weight leather gloves. All clothing and PPE must be oil-free.

l) Welding Gloves come in various thicknesses. Follow the manufacturer's recommendations:

  I. Stick welding produces the most heat, sparks and spatter. Since stick welding requires less dexterity it allows gloves that are thicker.
  II. Tig welding produces the lowest heat and the flame is concentrated to a certain area. These gloves can be thinner top grain leather.
  III. Mig welding uses less heat than stick welding and the user operates a welding gun with a trigger. Mig gloves tend to be lighter than stick gloves and have enhanced dexterity.

m) Hearing protection must be used if debris or molten metal could enter the ear.

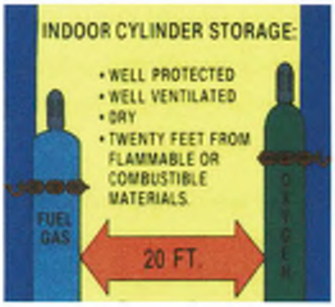
n) Leggings or chaps protect the lower legs and feet from heat hazards such as molten metal or welding sparks.

o) Use welding helmet with correct shade of filter.

Operations	Electrode size in 1/32" (0.8mm)	Arc current	Minimum protective shade
Shielded metal arc welding	< 3	< 60	7
	3 - 5	60 - 160	8
	5 - 8	160 - 250	10
	> 8	250 - 550	11
Gas metal arc welding and flux cored arc welding		< 60	7
		60 - 160	10
		160 - 250	10
		250 - 500	10
Gas tungsten arc welding		< 50	8
		50 - 150	8
		150 - 500	10
Air carbon	(light)	< 500	10
Arc cutting	(heavy)	500 - 1,000	11
Plasma arc welding		< 20	6
		20 - 100	8
		100 - 400	10
		400 - 800	11
Plasma arc cutting	(light)	< 300	8
	(medium)	300 - 400	9
	(heavy)	400 - 800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

TOC

7. Oxy-Acetylene Requirements.



a) Gas cylinders, whether empty or full, must be kept in a vertical position and be secured at all times. Caps must be in place when not in use.

b) Store "full" and "empty" cylinders separately in a well-ventilated space.

c) Oxygen cylinders in storage shall be separated from fuel-gas cylinders a minimum of 20 feet or by a noncombustible barrier at least 5 feet high, having a fire-resistance rating of at least one-half hour.

d) Gas cylinders must not be transported in vehicles with regulators attached unless the cylinder valve and regulator is protected with a UL listed attachment.

e) All equipment used for oxygen and acetylene such as cylinders, regulators, valves, hoses, and torches must be kept free of oil. When handling this equipment, be certain that gloves or hands are not oily or greasy.

f) Open oxygen cylinder valves slowly. Open fully when in use to eliminate possible leakage around the cylinder valves and regulator stem.

g) Purge oxygen valves, regulators, lines, and torches before use.

h) Stand to side of the oxygen regulator face when opening the oxygen cylinder valve.

i) If a cylinder leaks around the valve or fuse plug, tag it to indicate the fault, move it to a safe area and immediately notify the supplier to pick it up.

j) Keep cylinder caps securely screwed on all cylinders that are not in use and particularly while they are being moved.

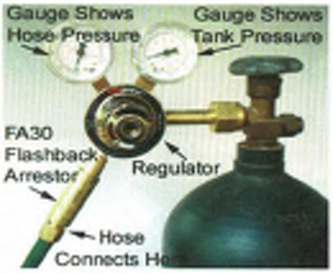
k) Blow out the cylinder valves before attaching the regulators.

l) Use an approved leak-detection liquid to detect flammable gas leaks. Ordinary soap solution may contain oils that are unsafe when used with oxygen cylinders. Leak detection liquids are available from welding supply companies.

m) Use a spark lighter for lighting a torch, not a butane cigarette lighter.

Note: Many FPP facilities prohibit butane lighters and strike anywhere matches brought onto the site.

n) Acetylene should not be used at a pressure greater than 15 psi, except for special applications so designated.



o) Flame arrestors and flash-back protection must be installed at the regulator on both the oxygen and acetylene cylinders.

p) No cylinder shall be placed inside a tank or vessel.

q) When not in use, compressed gas hoses shall be removed from tank, vessel or any enclosed space and the cylinder valve closed.

r) Oxygen and acetylene cylinders shall be placed far enough away from the work area so as to be safe from being hit by sparks or slag.

s) Acetylene valves when used shall be opened ¼ of a turn.

t) Hoses should meet the RMA/CGA IP-7 Standard. Use grade R or RM for acetylene only. Grade T for all fuel gases.

HOT WORK REVIEW

1. Hot work is considered which of the following. (Circle all that are correct)

   [✓ A. Sandblasting with silica sand]
   B. Using an electric drill or saw to cut wood
   [✓ C. Oxy/Acetylene cutting or welding]
   [✓ D. Soldering with a propane torch]
   [✓ E. Grinding anything that generate sparks]

2. In order to be an authorized Fire Watch you must have received training on the responsibilities of a Fire Watch and have received training on the use of fire extinguishers.

   [✓ A. True]
   B. False

3. A Hot Work Permit must be closed out when: (Circle all that are correct)

   [✓ A. At the end of the shift]
   ✗ B. When employees go to lunch
   [✓ C. When it exceeds the expiration time noted on permit]
   [✓ D. When the Hot Work task changes]
   [✓ E. When the location of hot work changes]

4. Finish this sentence. Remove all combustible and flammable materials within 35 Ft. radius of the hot work area?

5. What should be used to warn nearby personnel of the danger of hot work?

   A. Caution tape or Warning Barrier.

6. Finish this sentence. A fire watch must be maintained for at least 30 minutes after completion of work but some FPP facilities have expand the time to 60 minutes.

7. Complete the following sentences.

   A. Repairs are prohibited within 10 Ft. from the electrode holder.
   B. Butane lighters and strike anywhere matches are prohibited from being brought onto a FPP facility.
   C. All equipment used for oxygen and acetylene must be kept free of Oil.
   D. Welders must set up Shielding when working in commonly used areas.

HAZARD COMMUNICATION

1. Introduction.

a) Lubricants and solvents, epoxies and paints, diesel fuel and gasoline, acids, lime, sulfur, ammonia, and many other chemicals are either brought to phosphate operations or come from the manufacturing process itself.

b) Many chemicals can cause sterility, cancer, burns, and heart, kidney or lung disease, while others cause fires and explosions. Some chemicals cause illnesses that may occur years after an exposure.

2. Purpose.

a) The purpose of Hazard Communication standard (OSHA 29 CFR 1910.1200) is to reduce injuries and illnesses by ensuring:

b) Employers identify the chemicals at their site;

c) Determine which chemicals are hazardous;

d) Establishes a HazCom program, and

e) Informs each employee and contractor who can be exposed, about chemical hazards and appropriate protective measures.

3. Fundamentals of HAZCOM Standard.

a) Inventory the chemicals and determine which are hazardous. The chemical is hazardous when its Safety Data Sheet (SDS) or container label indicates it is a physical or health hazard.

b) Keep a list of the hazardous chemicals including those that are produced at the facility. This includes hazardous chemicals by mixing and through chemical reactions that occur.

c) Establish a written HazCom program.

d) Make sure that containers of hazardous chemicals are labeled.

e) Keep SDSs for the hazardous chemicals.

f) Train employees about the HazCom program and the hazardous chemicals to which they can be exposed.

4. Physical Hazards.

a) Explosives

b) Flammable gases and aerosols

c) Oxidizing gases and gases under pressure

d) Flammable liquids and solids

e) Self-reactive substances and self-heating substances

f) Pyrophoric liquids and solids

g) Substances which, in contact with water emit flammable gases

h) Oxidizing liquids, solids and peroxides

i) Corrosive to metals

5. Health Hazards.

a) Include toxics, carcinogens, irritants, corrosives, sensitizers, etc.

b) Acute Toxicity

c) Skin Corrosion/Irritation, serious eye damage/eye irritation

d) Respiratory or skin sensitization

e) Germ Cell Mutagenicity

f) Carcinogenicity

g) Reproductive Toxicology

h) Target organ systemic toxicity - single exposure, repeated exposure

i) Aspiration toxicity

6. Training.

a) Employer must instruct each employee about the physical and health hazards of chemicals in the work area, the protective measures to take, and the contents of the written HazCom program.

b) Upon initial assignment and whenever new hazards are introduced into the workplace.

c) Train employees on new GHS Labels & Safety Data Sheets by 12/1/2013.

d) Update labels, update Hazard Communication program and provide additional training on for newly identified hazards by 6/1/2016.

7. HAZCOM Exemptions.

a) Consumer Product:

   I. You use it as the manufacturer intended, and

   II. Does not expose the employee more often or for longer duration than ordinary consumer use.

b) Articles such as plastic and metal pipes, conveyor belts, steel beams, and tires:

   I. Releases no more than insignificant amounts of a hazardous chemical, and

   II. Pose no physical or health risk to exposed employees.

c) Personal items such as food, tobacco products, drugs, cosmetics, or other such personal items.

8. Container Labels.

a) Containers of hazardous chemicals must be marked, tagged, or labeled with the identity of the hazardous chemical and appropriate hazard warnings.

b) The label must be in English and prominently displayed.

c) Employees must replace a container label immediately if it is missing or if unreadable.

d) Bins, hoppers, tanks, or other stationary process containers may use signs, placards, process sheets, batch tickets, operating procedures or other suitable alternatives rather than a label.

   I. It must identify the container to which it applies, communicates the same information as required on the label, and be readily available throughout each work shift.

e) Portable Temporary Containers:

   I. When a substance is transferred from a labeled container into a portable unlabeled container and it's going to be used by the person who did the transfer, it does not require a label. If the material is not used up by the end of the shift, however, the container must be labeled or return the substance to its original labeled container.

TOC

GLOBAL HARMONIZATION SYSTEM

1. Introduction.

On March 26, 2012 the U.S. Department of Labor published the final rule updating the Hazard Communication Standard to incorporate the United Nations' Globally Harmonized System (GHS) of chemical classification and hazard communication.

It is anticipated that application of the GHS will:

a. Enhance the protection of human health and the environment by providing an internationally comprehensible system.

b. Provide a recognized framework to develop regulations for those countries without existing systems.

c. Facilitate international trade in chemicals whose hazards have been identified on an international basis.

d. Reduce the need for testing and evaluation against multiple classification systems.

2. GHS Label Elements.

a. Symbols (hazard pictograms): Convey health, physical and environmental hazard information, assigned to a GHS hazard class and category.

b. Signal Words: "Danger" or "Warning" are used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category.

c. Hazard Statements: Standard phrases assigned to a hazard class and category that describe the nature of the hazard.

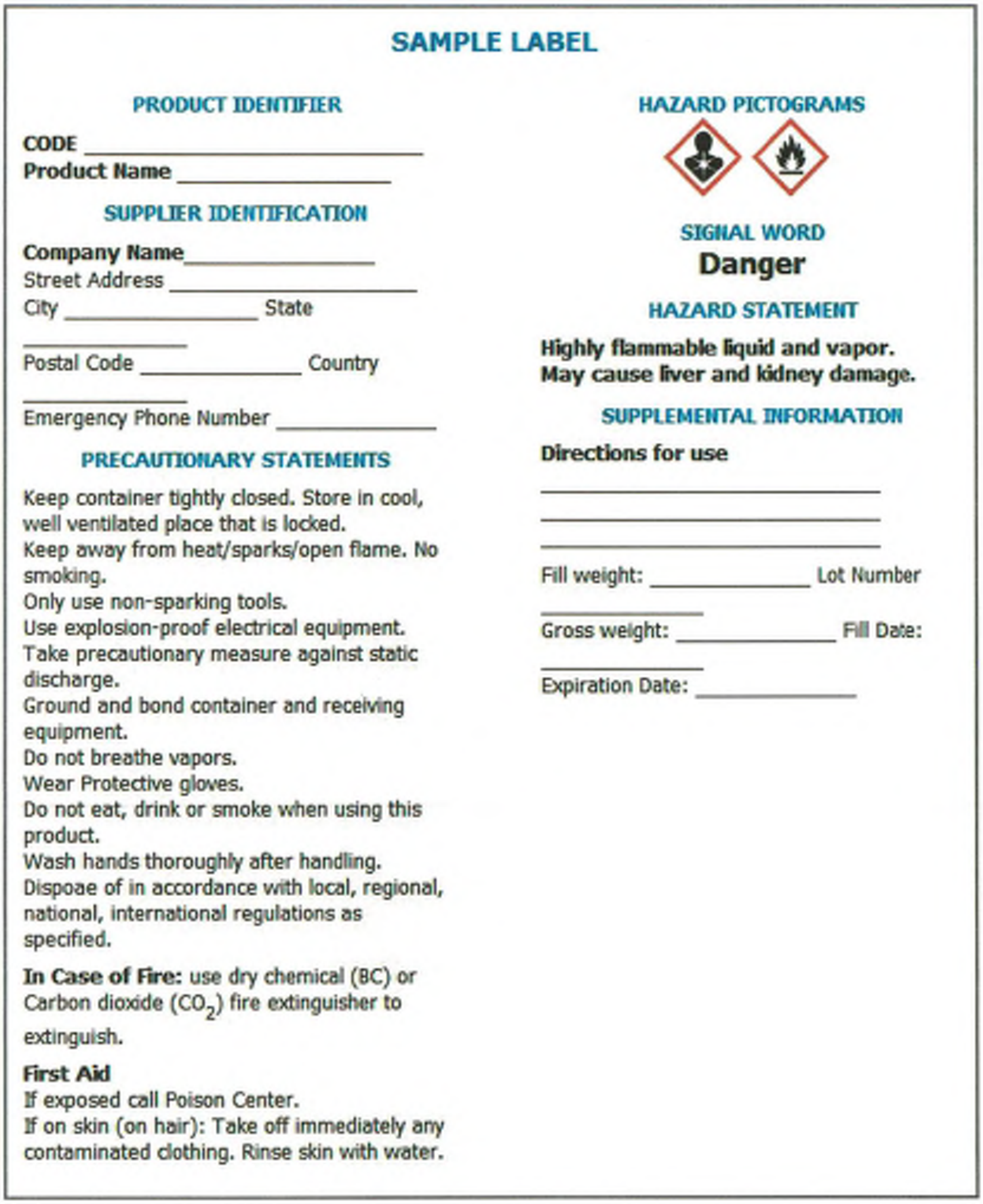
d. Precautionary Statements that describe the recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure.

e. Product Identifier that should match the SDS.

f. Alternative labeling systems such as the National Fire Protection Association (NFPA) 704 Hazard Rating and the Hazardous Material Information System (HMIS) are permitted for workplace containers. However, the information supplied on these labels must have no conflicting hazard warnings or pictograms.

GHS
The Global Harmonization System
of Classification and Labeling

3. GHS Label Elements



SAMPLE LABEL

PRODUCT IDENTIFIER

CODE ______________________

Product Name ______________

SUPPLIER IDENTIFICATION

Company Name ____________

Street Address ________________

City ____________ State ___________

Postal Code __________ Country ___________

Emergency Phone Number __________

PRECAUTIONARY STATEMENTS

Keep container tightly closed. Store in cool, well ventilated place that is locked.
Keep away from heat/sparks/open flame. No smoking.
Only use non-sparking tools.
Use explosion-proof electrical equipment.
Take precautionary measure against static discharge.
Ground and bond container and receiving equipment.
Do not breathe vapors.
Wear Protective gloves.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Dispoae of in accordance with local, regional, national, international regulations as specified.

In Case of Fire: use dry chemical (BC) or Carbon dioxide (CO_2) fire extinguisher to extinguish.

First Aid
If exposed call Poison Center.
If on skin (on hair): Take off immediately any contaminated clothing. Rinse skin with water.

HAZARD PICTOGRAMS

SIGNAL WORD

Danger

HAZARD STATEMENT

Highly flammable liquid and vapor.
May cause liver and kidney damage.

SUPPLEMENTAL INFORMATION

Directions for use

____

____

____

Fill weight: __________ Lot Number __________

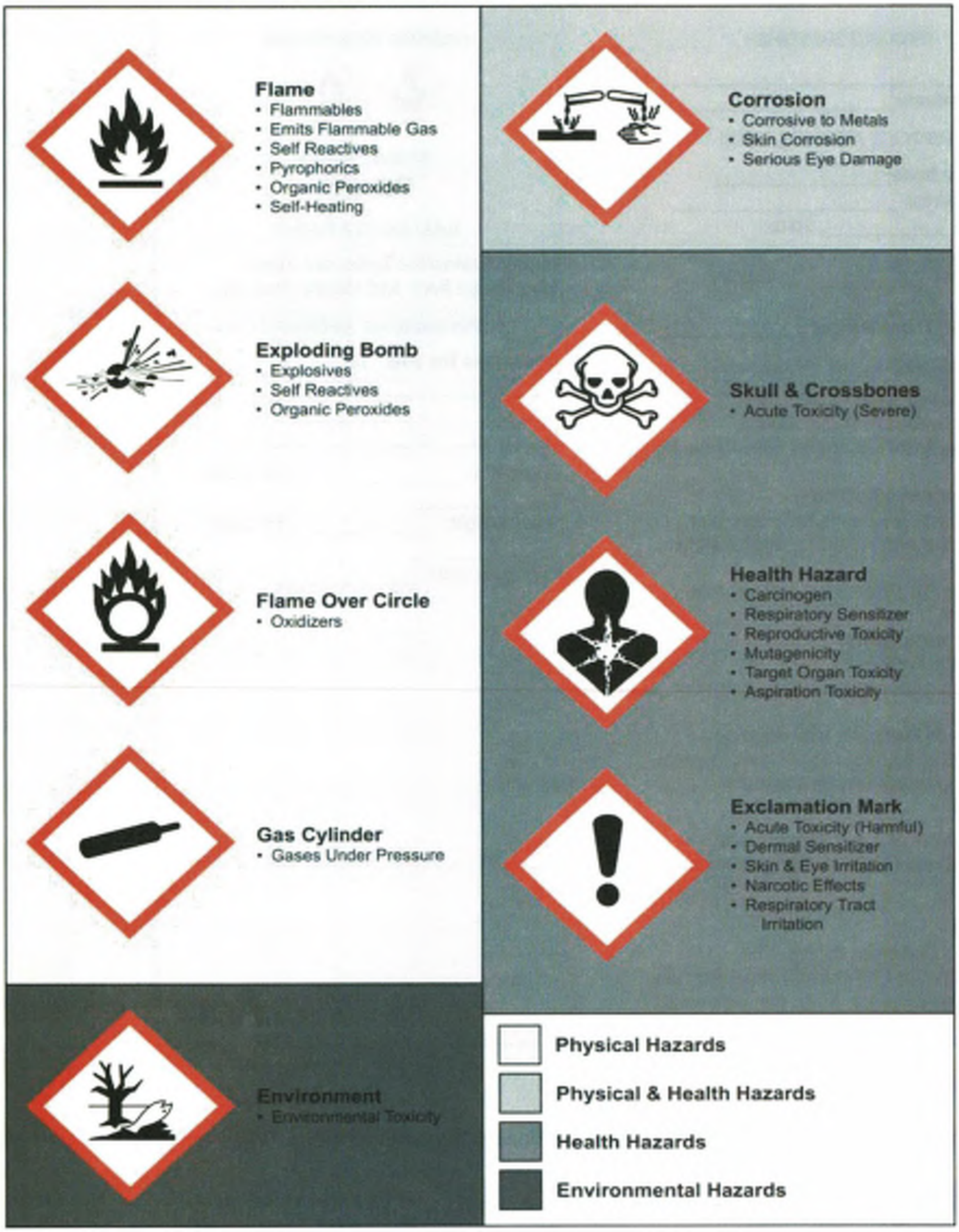
Gross weight: __________ Fill Date: __________

Expiration Date: __________

TOC

4. GHS Pictograms

GHS HAZARD PICTOGRAMS



Flame
- Flammables
- Emits Flammable Gas
- Self Reactives
- Pyrophorics
- Organic Peroxides
- Self-Heating

Exploding Bomb
- Explosives
- Self Reactives
- Organic Peroxides

Flame Over Circle
- Oxidizers

Gas Cylinder
- Gases Under Pressure

Environment
- Environmental Toxicity

Corrosion
- Corrosive to Metals
- Skin Corrosion
- Serious Eye Damage

Skull & Crossbones
- Acute Toxicity (Severe)

Health Hazard
- Carcinogen
- Respiratory Sensitizer
- Reproductive Toxicity
- Mutagenicity
- Target Organ Toxicity
- Aspiration Toxicity

Exclamation Mark
- Acute Toxicity (Harmful)
- Dermal Sensitizer
- Skin & Eye Irritation
- Narcotic Effects
- Respiratory Tract Irritation

☐ **Physical Hazards**
▒ **Physical & Health Hazards**
▓ **Health Hazards**
■ **Environmental Hazards**

TOC

5. Safety Data Sheets.

a. Safety Data Sheets (SDS) has replaced the terminology for Material Safety Data Sheets.

b. Must have an SDS for each hazardous chemical which is produced or used.

c. Must be legible, accurate, and in English.

d. Must be available to employees who can be exposed. As an alternative, SDSs can be stored in a central location as long as they're available in an emergency.

Note: Many FPP facilities store their SDSs on the computer or through an internet service, which as long as it is readily available and can be printed if needed, is satisfactory.

e. Keep a chemical's SDS for as long as the chemical is at the facility and up to 30 years after it is no longer on site.

f. Replace an outdated SDS upon receipt of an updated revision, and

g. Obtain an accurate SDS as soon as possible after becoming aware of an inaccuracy.

h. Contractors shall have SDSs available for specific materials brought on site and must submit the SDSs to the host facility before use.

i. Previously there was no required format for MSDSs. Different manufacturers were allowed to use different forms. The GHS requires that the information on the SDS be presented using specific headings in a specified sequence.

j. The SDS format is the same as the ANSI standard format which is widely used in the U.S. and is already familiar to many employees. The format of the 16-section SDS should include the following sections:

I. Section 1. Identification

A. Product identifier

B. Manufacturer, importer, or other responsible party information

C. Recommended use of the chemical

II. Section 2. Hazard(s) identification

A. The hazard classification of the chemical (e.g., flammable liquid)

B. Signal word

C. Hazard statement(s)

D. Pictograms

E. Precautionary statements(s)

F. Description of any hazards not otherwise classified

G. For a mixture that contains an ingredient(s) with unknown toxicity, a statement describing how much (percentage) of the mixture consists of ingredient(s) with unknown acute toxicity. Please note that this is a total percentage of the mixture and not tied to the individual ingredient(s).

III. Section 3. Composition/information on ingredients

A. Substances

B. Mixtures

C. The concentration (exact percentages) of each ingredient

D. Chemicals where a trade secret is claimed: A statement that the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

IV. Section 4. First-Aid measures

A. Necessary first-aid instructions

B. Description of the Acute or delayed symptoms or effects

C. Recommendations for immediate medical care and special treatment needed, when necessary.

V. Section 5. Fire-fighting measures

A. Extinguishing equipment and information and what is not appropriate for a particular situation.

B. Specific hazards that develop from the chemical during the fire.

C. Recommendations on special protective equipment or precautions for firefighters.

VI. Section 6. Accidental release measures

A. PPE needed and precautions to take during clean up.

B. Emergency procedures, including instructions for evacuations.

C. Methods and materials used for containment (e.g., covering the drains and capping procedures).

D. Cleanup procedures (e.g., appropriate techniques for neutralization, decontamination, cleaning or vacuuming; absorbent materials; and/or equipment required for containment/clean up).

VII. Section 7. Handling and storage

A. Precautions for safe handling, including incompatible chemicals, environmental concerns, and providing advice on general hygiene practices.

B. Recommendations on the conditions for safe storage, including any incompatibilities. Provide advice on specific storage requirements (e.g., ventilation requirements).

VIII. Section 8. Exposure controls/personal protection

A. OSHA Permissible exposure Limits (PELs), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and any other exposure limit used.

- PELs were established by OSHA to limit exposures to chemicals to concentrations that most workers can handle without any adverse side effects over an 8-hour period.

B. Engineering controls (e.g., use local exhaust ventilation, or use only in an enclosed system).

C. PPE measures to prevent illness or injury from exposure to chemicals.

D. Any special requirements for PPE, protective clothing or respirators (e.g., type or glove material such as PVC or nitrile rubber gloves; and breakthrough time of the glove material).

IX. Section 9. Physical and chemical properties

A. Appearance

B. Odor

C. Odor threshold

D. pH

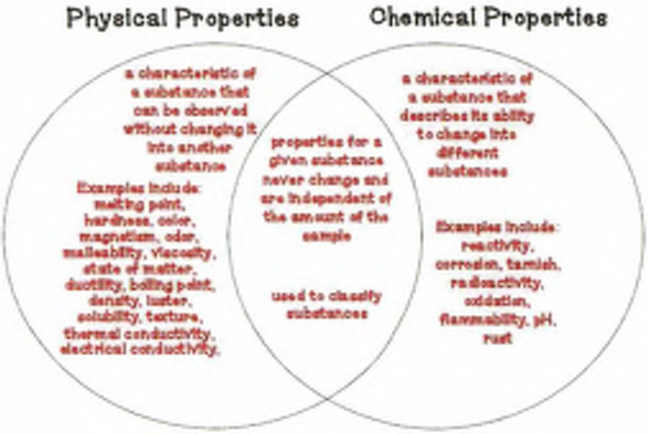
E. Melting point/freezing point

F. Initial boiling point and boiling range

G. Flash point

H. Evaporation rate

I. Flammability (solid, gas)


Physical Properties
Chemical Properties
a characteristic of a substance that can be observed without changing it into another substance
Examples include: melting point, hardness, color, magnetism, odor, malleability, viscosity, state of matter, ductility, boiling point, density, luster, solubility, texture, thermal conductivity, electrical conductivity.
properties for a given substance never change and are independent of the amount of the sample
used to classify substances
a characteristic of a substance that describes its ability to change into different substances
Examples include: reactivity, corrosion, tarnish, radioactivity, oxidation, flammability, pH, rust

J. Upper/lower flammability or explosive limits
K. Vapor pressure
L. Vapor density
M. Relative density
N. Solubility
O. Auto-ignition temperature
P. Decomposition temperature and
Q. Viscosity
R. The SDS may not contain every item noted above. The SDS will include a notation to that effect.

X. Section 10. Stability and reactivity
   A. Reactivity
   B. Chemical stability:
   - Whether the chemical is stable or unstable under normal ambient temperature and conditions while in storage and being handled.
   - Description of any stabilizers that may be needed to maintain chemical stability.
   - Indication of any safety issues that may arise should the product change in physical appearance.

   C. Other:
   - Indication of the possibility of hazardous reactions and the conditions under which it may occur.
   - List of all conditions that should be avoided (e.g., static discharge, shock, vibrations, or environmental conditions that my lead to hazardous conditions).
   - List of all classes of incompatible materials (e.g., classes of chemicals or specific substances) with which the chemical could react to produce a hazardous situation.
   - Potential hazardous decomposition products that could be produced from use, storage, or heating.

XI. Section 11. Toxicological information
   A. Information on the likely routes of exposure (inhalation, ingestion, skin and eye contract).
   B. Description of the delayed, immediate, or chronic effects from short- and long-term exposure.
   C. The numerical measures of toxicity (e.g., acute toxicity estimates such as the LD50 (Median lethal dose)) – the estimated amount (of a substance) expected to kill 50% of test animals in a single dose.
   D. Description of the symptoms.
   E. If chemical is listed in the National Toxicology Program (NTP) on Carcinogens or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) or found to be potential carcinogen by OSHA.

XII. Section 12. Ecological information
XIII. Section 13. Disposal considerations
XIV. Section 14. Transport information
XV. Section 15. Regulatory information
XVI. Section 16. Other information

k. Although the headings for Sections 12-15 are mandatory, OSHA will not enforce the content of these four sections because these sections are within other agencies' jurisdictions.

6. Anhydrous Ammonia.

a. Ammoniated phosphate fertilizer improves both the quantity and quality of protein-containing crops. Nitrogen content in fertilizers directly influences a plant's ability to produce protein. Plants require nitrogen to produce this protein. Ammonia, NH3, is the only viable source of nitrogen for producing large amounts of protein.

b. Anhydrous Ammonia is a colorless clear liquid when stored at –28 degrees F. at ambient pressure.
  I. Exposure to ammonia liquid will result in frostbite.

c. Anhydrous Ammonia can also be stored as a liquid at warmer temperatures when stored under pressure. Many vessels in the phosphate industry store ammonia at over 100 psi.

d. Anhydrous Ammonia boils at –28 degrees F, which then changes to a gas.
  I. Small to medium sized releases will "flash" or boil off rapidly creating a respiratory hazard.
  II. Large-scale releases may "auto-refrigerate" and cause a puddle of ammonia to be present. Auto-refrigeration can reach temperatures of -70 degrees F. Do not walk through any puddles where ammonia could be present.

e. "Anhydrous" means "without water" and anhydrous ammonia contains almost no moisture.

f. Anhydrous Ammonia will react readily with water to form ammonium hydroxide which is used in household cleaning in a much diluted state.

g. Anhydrous Ammonia gas in its natural state is an invisible gas, but high humidity or large liquid releases will allow it to a white puffy cloud looking gas.

h. An important property of Anhydrous Ammonia is its pungent odor.

i. It can usually be detected at concentrations in the range of 3 - 5 parts per million (ppm).

j. The effects of exposure to anhydrous ammonia are caused by both the chemical and physical properties of the substance:
  I. Harmful if inhaled at high concentrations.
  II. OHSA's PEL is 50 ppm as an 8-hour time-weighted average.
  III. AGCIH's TLV is 25 ppm as an 8-hour time-weighted average.
  IV. 300 ppm is considered Immediately Dangerous to Life and Health (IDLH).
  V. As noted earlier, liquid anhydrous ammonia is at –28 degrees F and can cause frostbite.
  VI. Anhydrous Ammonia is a caustic and will cause chemical burns. The pH of ammonia is above 11. The areas of the body containing moisture will be effected the most (eyes, respiratory tract, areas with sweat)

DANGER
Anhydrous ammonia.
Risk of blindness, lung damage, burns and death.
Wear ventless goggle or full face shield & rubber gloves. Know emergency procedures.

k. If you encounter ammonia, leave the area immediately by going crosswind, then upwind to a safe location.

l. For first aid, use water to rinse from eyes and skin.

m. If large concentrations have been inhaled, oxygen may be provided. Seek medical attention.

TOC

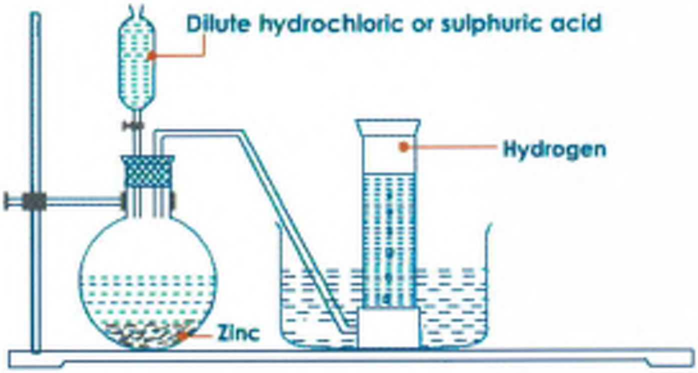
7. Hydrogen Gas.

a. When acid reacts with metals, some of the hydrogen in the acid can be given off as hydrogen gas. Over a period of time, the hydrogen gas will accumulate in pockets within tanks, pipes, reactors, and battery charging areas, etc.

b. Hydrogen gas is flammable and even in small amounts can be very dangerous when ignited.

c. Care must be taken to ensure that accumulated hydrogen gas is dissipated before any hot work is started.

d. Spaces where hydrogen gas may accumulate must be tested for flammability before hot work begins.



8. Sulfuric Acid/Sulfur Dioxide Gas.

a. Sulfuric acid is produced and stored at phosphate fertilizer processing plants at 93-98% strengths.

b. Sulfur dioxide gas (SO2) and sulfur trioxide (SO3) are present in the process and may be given off from leaks in the plant or from the stacks when plants are starting up or shutting down.

c. Sulfuric acid is a colorless liquid to slightly yellow.

d. Sulfuric acid is very corrosive to metals and organic materials and will cause severe burns to human tissue. The pH can range from 0 – 2.5 depending on the concentration. Some parts of the process will have heated sulfuric acid from 180 to 200 degrees F.

e. Fine mists of sulfuric acid may go unnoticed until the skin or eyes are affected.

f. Chronic (long-term) exposure to certain acid mists without proper personal protective equipment can be carcinogenic.

g. Assume any liquid leak from pipes to be concentrated sulfuric and avoid contact with the liquid.

h. It is soluble in water with release of heat. If water is added to the acid, it will react violently and give off an acid fume

i. Sulfur dioxide gas is irritating to the respiratory tract and has a 5 ppm PEL but the TLV is 0.25. Sulfur trioxide gas can be seen as a white cloud because it too takes in moisture.

j. Care should be taken when preparing to work on leaks in the sulfuric acid plant fume systems. Proper respiratory and body protection will be required.

k. As with any gas release, exit the area crosswind to a safe atmosphere when exposure is higher than the permissible exposure limit.

TOC

9. Phosphoric Gas.

a. Phosphoric acid is a weaker acid than sulfuric acid but still has safety and health implications.

b. Phosphoric acid is manufactured in bulk at phosphate fertilizer processing plants.

c. Phosphoric acid can cause skin rashes and chemical burns if not flushed from the skin immediately.

d. PH ranges from 1 – 2.5 depending on the concentration.

e. The PEL is 1 mg/m3.

f. To avoid possible respiratory damage, wear respiratory equipment when working around phosphoric acid mists; normally found above open tanks.

10. Sulfur (Molten or Solid).

a. In the solid form it is a pale yellow crystalline solid with a faint odor of rotten eggs. If heated above 450° F it can create a fire / explosion hazard. Sulfur dust in the air or on the ground is easily ignited.

b. The molten form above the 290°F and is a yellow to red liquid. Hot enough that plastic or rubber may melt or lose strength. Causes thermal burns to skin. Cools rapidly and solidifies if released.

c. Exercise caution walking on the surface of a spill to avoid breakthrough into pockets of molten sulfur below the crust. Do not attempt to remove sulfur impregnated clothing because of the danger of tearing flesh if a burn has resulted.

d. Molten sulfur fume cause irritation to skin, eyes and mucous membranes. The fumes off of molten sulfur contain varying amounts of hydrogen sulfide.

e. Pyrophoric iron sulfide could be formed when sulfur and water are in contact with steel. The iron sulfide acts as a catalyst to ignite the hydrogen sulfide gas.

f. Produces sulfur dioxide gas if fire occurs.

11. Lead.

a. Major source of lead in phosphate processing plants is the disturbing of lead-based industrial paints.

b. Contractors working on lead-based paints must have program complying with OSHA's lead standard.

c. Painted surfaces that are going to be disturbed such as grinding, sand blasting, pressure washing, welding or cut by using an oxy-acetylene torch must be first evaluated for lead exposure. Get with the facility representative to determine if the painted surface you are about to disturb contains lead.

12. Asbestos.

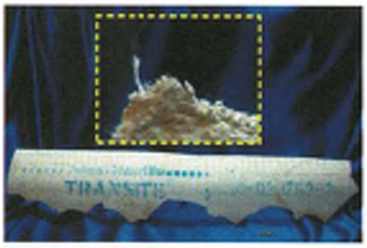
a. Present in building siding (Transite), sprayed-on fireproofing, pipe insulation, and gasket materials.

b. All asbestos removal must be done by properly trained employees.

c. Contact a facility representative if any suspect asbestos containing materials are encountered.

d. Many plants have abated (removed) much of the asbestos containing materials.

e. Cutting, breaking, drilling or handling of Transite siding can lead to an exposure and must be performed by trained employees.



TOC

HAZARD COMMUNICATION REVIEW

1. One fundamental of the Hazard Communication standard is for employers to inventory the chemicals and determine which are hazardous. What other fundamental elements is part of the standard. (Finish the sentences)

   A. Keep a List of the hazardous chemicals.
   B. Establish a written HAZCOM Program.
   C. Make sure that containers of hazardous chemicals are Labeled.
   D. Keep SDS's for the hazardous chemicals.
   E. Train employees about the HazCom program and the hazardous chemicals to which they can be exposed.

2. Containers of hazardous chemicals must not be used if the label is missing or unreadable?

   [✓ A. True]
   B. False

3. The new GHS required all labels made after June 2016 to include what? (Circle all that are correct)

   [✓ A. Hazard pictograms]
   B. List of every ingredient and their percentages
   [✓ C. Signal Words: "Danger" or "Warning"]
   [✓ D. Hazard Statements]
   [✓ E. Precautionary Statements]
   [✓ F. Product name]

4. Finish this sentence. Employers were required to train all their employees on the new GHS labeling and SDS system by what date? ~~6/1/2016~~ 12/1/2013.

5. Chemicals that contractors bring on site must have the SDSs submitted to the host facility before use?

   [✓ A. True]
   B. False

6. Match the appropriate chemical with its hazard. (Place letter next to chemical)

A. Anhydrous Ammonia	D	D	A. Liquid form is handled at above 290 degrees.
SO_2 #4 B. Sulfuric Acid	F	E	B. Found in building siding, gaskets and insulation.
C. Sulfur Dioxide	E	F	C. Flammable gas when acids reacts with metals.
D. Sulfur	A	A	D. Harmful if inhaled. Liquid can cause frostbite.
E. Asbestos	B	C	E. May be released during plant start up or shut down.
F. Hydrogen	C	B	F. Very corrosive and can cause severe burns.

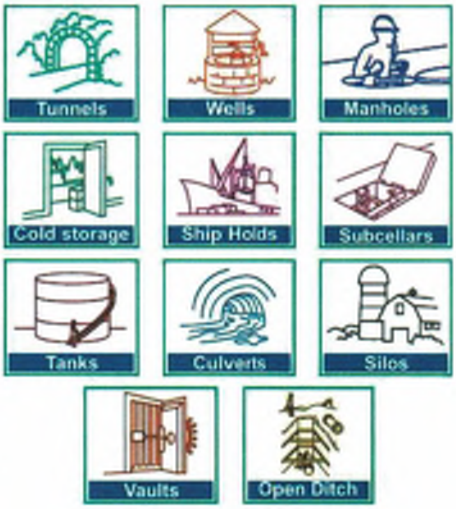
TOC

CONFINED SPACE ENTRY

1. Introduction.

Nearly two-thirds of all fatal accidents in confined spaces are attributed to atmospheric contamination. Another 10% of fatalities are caused by engulfment. Other causes are related to factors, including falls, electrocution, struck by a moving object and heat stress.

2. Definitions.



a) Confined Space:
   I. Large enough for employee to enter & work; and
   II. Restricted means of entry/exit; and
   III. Not designed for continuous occupancy.

Note: some FPP facilities consider an excavation a confined space if deeper than 4 feet. The new OSHA confined space construction standard exempts excavations.

b) Permit Required Confined Space (PRCS):
   I. Potential for hazardous atmosphere, or
   II. Potential of material engulfing worker, or
   III. Configuration that may trap worker, or
   IV. Contains other recognized hazards.

c) Entry:
   I. Breaking the plane of the confined space portal with any part of the body.

d) Non-Permit Confined Space (NPCS).
   I. A space, which meets the confined space definition but, after evaluation is unlikely to have potential hazards or has the hazards eliminated by engineering controls.

3. Hazard Identification.

a) Employers shall conduct an initial survey of the facility to identify confined spaces and maintain a documented inventory of them.

b) Hazards shall be identified for each confined space prior to entry.

c) Employers must develop specific entry procedures for permit required confined spaces that identify known hazards as well as the actions required to eliminate or control those hazards.

d) Warning signs of a confined space and the hazard should be posted near entrances.

Note: many facilities use signs but due to the corrosive nature of the chemical plants, not all confined spaces are posted.

Confined Space
HAZARDS
If you are required to construct or work in a :
You are working in a confined space.
Hazards in confined spaces can include:
Lack of Oxygen
Fire & Explosion
Toxic Atmospheres
Uncontrolled Energy
Temperature Extremes
Collapse of Solids or Liquids

e) Hazards to consider include:
   - I. Engulfment by liquid or granular material;
   - II. Entrapment due to size, shape or obstacles inside;
   - III. Radiation sources;
   - IV. Mechanical hazards such as moving parts;
   - V. Physical hazards: electrical hazards, thermal & noise;
   - VI. Atmospheric hazards:
     - A. Oxygen deficiency/enrichment (below 19.5% - above 23.5%); (normal → 20.9 - 21.0%) (10% below LFL)
     - B. Flammable (Between LFL and UFL); flammability greater than or equal to ten percent of the LFL is considered hazardous.

Note: many facilities have a more stringent requirement of 0% LEL.

   - C. Toxic gases (above the PEL). Any level > zero should be investigated. CO, H_2S, CO^2

4. Opening the Confined Space.

a) Many employers allow for a confined space to be opened prior to having a completed confined space permit. This does not mean there are no hazards involved with this task.

b) Before opening the space, all potential hazards must be known and addressed.
   - I. Hazardous chemicals (liquid, solid or gas), pressurized chemicals, or flying projectiles must be isolated through lockout tagout along with draining, venting or purging.
   - II. Fall hazards must be addressed prior to opening. Temporary hard barricading is preferred. If soft barricade is used, the barricade should be a safe distance from opening.

Note: many facilities require a Safety Watch to be posted if soft barricades are used for fall hazards.

5. Classification.

a) A qualified person may designate the class of confined space based on an evaluation.

b) All confined spaces shall be treated as permit spaces until determined to be otherwise by the qualified person.

c) NPCS:
   - I. Remember, potential hazards are unlikely or the hazards are eliminated by engineering controls.
   - II. This generally means no atmospheric hazards are present or likely to be present. This includes the task or job being performed in the confined space.
   - III. Atmospheric testing is required prior to entry and if determined by the qualified person, periodic testing may be needed.
   - IV. Other hazards such as electrical or mechanical are eliminated by lockout tagout.
   - V. Many facilities require a type of permit, but it has fewer requirements than a PRCS.

d) PRCS:
   - I. Any confined space which presents a hazard to occupants must have controlled entry by means of a permit system.

II. A permit includes:
   A. Identification of hazards to be controlled and communicate to all those involved;
   B. Date of entry, location, names of entrants, attendants and type of work performed;
   C. Safety equipment required;
   D. Identification of test instruments, type of tests required and test results;
   E. A rescue plan and equipment needed in the event of an emergency.
   F. The duration of the permit, not to exceed the time needed to complete the work or one work shift, whichever is less.

III. Permits must be revoked when conditions or work activities change or could introduce a hazard not included in the original permit.

IV. Permits must be completed and then signed by the Qualified Person/Entry Supervisor.

Note: Many FPP facilities require a facility personnel be the authorized Entry Supervisor who approves the permit. Depending on the space, some require the Superintendent to approve the permit.

6. Atmospheric Testing.

a) Atmospheric testing of confined spaces must be conducted prior to entry and includes oxygen, flammability/combustibility and toxicity.

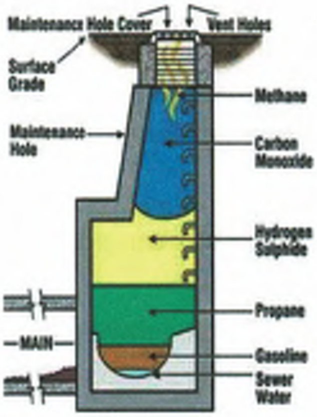
b) Atmospheric testing must be conducted by a qualified person with specialized skills.

c) Testing instruments must be calibrated per the manufacture recommendations. At a minimum, a bump test is required before the days use.

d) Conduct with the ventilation system off first.

e) All levels of the space where entrants will be must be tested.

f) Entry team members should be permitted the opportunity to observe testing.



g) Retesting is required once any ventilation system is used.

h) Periodic testing is required to ensure acceptable atmospheric conditions are maintained.

i) Continuous testing is recommended if hazardous atmospheres could develop. This includes when job requires hazardous chemicals to be brought into the space such as cleaning chemicals, solvents, glues, adhesives, paint, welding, etc.

Note: The recently revised Construction Standard put more emphasis on continuous monitoring and when it must be used.

7. Ventilation.

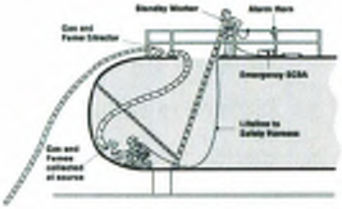
a) Supply/Positive flow air ventilation should always be the primary method of ventilation.

b) Air movers shall be located to prevent entry of contaminants, (e.g., carbon monoxide).

c) Ventilation shall be maintained during the entry if conditions may become unacceptable.

d) Exhaust ventilation may be used to supplement positive ventilation.

e) Localized ventilation can be used to remove contaminants.



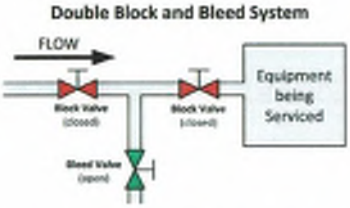
f) Efforts should be made to prevent ventilation systems from being accidently shut off.

g) Ventilation must provide enough air re-circulations to ensure air quality is adequate. If there is a potential for a hazardous atmosphere, 7.5 re-circulations should be achieved.

8. Isolation.

a) All hazardous material, high pressure, high temperature and other piping that could be reasonably expected to introduce a hazard shall be isolated by:

   I. Blinding between two pipe flanges;
   II. Disconnecting and blanking;
   III. Misaligning piping;
   IV. Double block and bleed.



9. Entry Team.

a) In order to be an Attendant, Entrant or Entry Supervisor for a Permit Required Space you must trained on those duties.

b) Attendant:

   I. Must be trained before being assigned duties;
   II. Must be located immediately outside the entry/exit point;
   III. Must communicate with the entrants inside the space;

Note: most mine operators require the attendant to track all entrants.

   IV. Monitor for adverse changes in conditions;
   V. Prevent unauthorized entry;
   VI. Direct entrants to exit the confined space whenever unanticipated hazards arise or entrants exhibit signs of overexposure or surrounding conditions create hazards for the entrants.
   VII. Initiate evacuation or emergency procedures including summoning rescue.

c) Entrant:
   - I. Must be trained before being assigned duties;
   - II. Recognize hazards and use the equipment for controlling those hazards;
   - III. Inspect for hazards not previously identified during initial entry;
   - IV. Respond to emergencies and possess the skills necessary for self-rescue;
   - V. Recognize the symptoms of exposure to hazardous conditions & exit the space;
   - VI. Notify the attendant of any symptoms or other emergency conditions;

d) Entry Supervisor:
   - I. Must be trained before being assigned duties;
   - II. Know the requirements of the written confined space program;
   - III. Verify all required actions are taken prior to signing the permit;
   - IV. Verify rescue services are available prior to and through-out entry;
   - V. Terminate entry, removal of personnel and revoke the permit when required.

10. Rescue.

a) Written emergency response plan shall be developed for potential emergencies and to provide for timely evacuation, retrieval, or rescue of entrants. The plan must include:
   - I. Evacuation instructions when certain hazards are identified;
   - II. Use of Non-entry Retrieval methods needed by trained personnel;
   - III. Use of a mechanical retrieval device if vertical distance is more than 5 feet deep.
   - IV. Rescue Entry methods needed by trained rescue team members when Non-entry Retrieval is not feasible.
   - V. Whether a horizontal or vertical rescue procedure will be needed.
   - VI. Effective means to summon rescuers in a timely manner may include, but is not limited to radio, cell phone, pager, etc.

b) A full body harness with lifeline must be worn by entrants in dangerous atmospheres.

Note: many miner operators require a full body harness worn by entrants for all entries.

c) Atmospheric monitoring must be conducted to ensure the safety of rescue personnel.

d) Emergency response personnel training should include:
   - I. Simulated actual rescue conditions by conducting practice drills annually.
   - II. Persons performing CPR, AED, and/or first aid should possess current certification.

e) Rescue entry by an attendant may only be accomplished if the attendant has been trained in rescue procedures, is properly equipped, and only if the attendant is relieved by another trained attendant.

11. Construction Standard.

a) Construction sites are continually evolving, with the number and characteristics of confined spaces changing as work progresses. Over 60% of all confined space incidents occurred during construction, repairing or cleaning activities.

TOC

b) OSHA 29 CFR 1926 AA (Confined Space in Construction) was published May 4, 2015 and became effective August 3, 2015.

c) The new rule applies to employees engaged in construction activities at a worksite with one or more confined spaces.

d) Exemptions:

I. Subpart Y (diving);

II. Subpart P (excavations);

A. If there is a confined space within an excavation, such as a sewer pipe, and a worker enters the pipe to perform work, is covered by Subpart AA.

III. Subpart S (underground construction).

e) General Industry standard is when employees are engaged in maintenance. Maintenance is keeping equipment or a structure in proper condition through routine, scheduled or anticipated measures without having to significantly alter the structure or equipment in the process.

f) Construction standard applies to new construction work, but can also include the major repair of existing facilities or the replacement of structures and their components.

g) Definitions:

I. **Host Employer** is the employer that owns or manages the property where the construction work is taking place.

II. **Entry Employer** is any employer who decides that an employee it directs will enter a permit space. The Entry Employer must decide if their employees will enter or not.

III. **Competent Person** means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

IV. **Controlling Contractor** is the employer that has overall responsibility for construction at the worksite. Is the primary point of contact for information about permit spaces at the work site.

A. If the controlling contractor owns or manages the property, then it is both a controlling employer and a host employer.

h) Identification:

I. Before work begins at the worksite, each contract employer must ensure that a competent person identifies all confined spaces for employees it directs who will enter and identify each space that is a permit space.

II. The contract employer who identifies, or who receives notice of, a permit space must:

A. Post danger signs or use an equally effective means, of the existence and location of each permit space and;

B. Inform, in a manner other than posting, its employees' authorized representatives and the controlling contractor of the existence and location of, and the danger posed by, each permit space.

III. The contract employer who has not authorized its employees to work in that space must take effective measures to prevent those employees from entering that permit space.

I. If the contract employer decides its employees will enter a permit space, that employer must have a written permit space program.

TOC

i) Communication:

  I. Host Employer must provide the following information, if it has it, to the Controlling Contractor:

    A. The location of each known permit space;

    B. Hazards or potential hazards in each space;

    C. Any precautions that the host employer or any previous controlling contractor or entry employer implemented.

  II. Controlling Contractor must do the following before entry operations begin:

    A. Receive Host Employers information;

    B. Provide the information from the Host Employer along with any other hazards or precautions to each Entry Employer entering a permit space; and

    C. Any other employer at the worksite whose activities could foreseeably result in a hazard in the permit space (this would include employees working outside but near the permit space that could affect conditions inside the space such as operating mobile equipment.

  III. Entry Employer must do the following before entry operations begin:

    A. Obtain information from Controlling Contractor;

    B. Inform the controlling contractor of the permit space program that will be used, including any hazards likely to be confronted or created in each permit space.

  IV. Both the Controlling Contractor and the Entry Employer must coordinate efforts when more than one entity performs permit space entry at the same time or when outside activities could introduce hazards during permit space entry.

  V. After entry operations is complete, the Controlling Contractor, Entry Employer and Host Employer should exchange information concerning hazards confronted or created in the permit space(s) during entry.

j) Monitoring:

  I. Requires continuous atmospheric monitoring whenever possible. Exceptions would be testing equipment not commercially available or periodic monitoring is sufficient.

  II. Requires continuous monitoring of engulfment hazards.

    A. For example, when workers are performing work in a storm sewer, a storm upstream from the workers could cause flash flooding. An electronic sensor or observer posted upstream from the work site could alert workers in the space at the first sign of the hazard, giving the workers time to evacuate the space safely.

k) Confined Space Written Plans:

  I. Entry employers do not necessarily have to develop a separate written plan for each individual entry. Rather, an entry employer may reuse a previously developed program, or a program developed by another employer, so long as it is appropriate for the specific entry operations and the type of work involved.

l) Permit:

  I. Permits maybe suspended, instead of cancellation, in the event of changes from the entry conditions listed on the permit or an unexpected event requiring evacuation of the space. The space must be returned to the entry conditions listed on the permit before re-entry.

  II. Permit must include name of attendant and entry supervisor and it must be changed if the person serving in those capacities is replaced by someone else.

CONFINED SPACE REVIEW

1. In order for a space to be defined as a Confined Space, what three things must it meet? job 2.a) i ii iii

   A. Large Enough to enter.
   B. Restricted Means of Entry or exit.
   C. Not designed for Continuous Occupancy.

2. Breaking the plane of the confined space portal with any part of the body is considered entry and requires a completed confined space permit.

   [✓ A. True]
   B. False

3. Match the appropriate description with its hazard. (Place letter next to hazard)

A. Mechanical D	A. Toxic gases above the PEL
B. Entrapment F	B. Covered by liquid or granular material
C. Atmospheric A	C. Electrical, falls, noise
D. Engulfment B	D. Moving parts.
E. Physical C	E. Insects, reptiles or heat.
F. Environmental E	F. Size, shape or obstacles inside.

4. A permit must be closed out or cancelled when? (Circle all that are correct)

   [✓ A. Past the expiration time.]
   [✓ B. At the end of the shift.]
   [✓ C. When the task or job changes from what is listed on the permit.]
   [✓ D. When new or unexpected hazards arise.]
   E. When additional authorized entrants are needing to enter the space.

5. At a minimum, what is required before using an atmospheric meter to test the air quality of a confined space? Calibrated and Bump tested.

6. Atmospheric testing is not required before entry if the space is thought to have no atmospheric hazards?

   A. True
   [✓ B. False]

7. In addition to this training you are receiving today, what is required before any person can perform the duties of an Entrant, Attendant or Entry Supervisor?

   A. Confined Space Training., Certified Training, Specific Training.

TRENCHING AND EXCAVATION SAFETY

OSHA 29 CFR 1926.650-652 & ANSI/ASSE A10.12-1998 (R2010)

1. Introduction.

a) Excavating is recognized as one of the most hazardous construction operations. The purpose of this section is to assist contractors, safety and health professionals and others in the recognition of trenching and shoring hazards and their prevention.

b) Contactors should always contact site management or safety personnel to identify specific trenching and excavation requirements prior to arriving on site to perform work.

  I. Most mine facilities exempt various areas or specific tasks from this trenching and excavation safety requirements. Examples of the exemptions are:

  II. The removal and stacking of gypsum on gypsum stacks;

  III. Cleaning of ditches or storm ponds;

c) A Trenching and Excavation Permit may be required before digging. At some facilities, excavations greater than 2 feet in depth will require the Permit while others may require at 1 foot. It is important to check with the facility to determine the exact requirements.

2. Underground Hazards.

a) The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined by the Competent Person before digging.

b) The Competent Person shall use engineering drawings, utility company services or other resources as appropriate. Any special precautions, such as hand digging, shall be noted on the Trenching & Excavation permit.

c) Utility companies or owners shall be contacted prior to digging, advised of the proposed work, and asked to establish the location of the utility underground. When digging near public right of ways or utility company right of ways, Sunshine 811 must be called 48 hours prior to digging. Because the exact location of underground installations may not be certain, due caution should be used when digging.

d) Mechanical digging is not allowed near the utility lines. Check with the facility for the exact distance when manual digging is required.

Note: Many FPP facilities require manual digging when the utility line is unknown or when within 3 feet of the line, pipe or cable.

3. State Laws.

a) Most states have laws established on trenching and excavations. For example, Sunshine 811 is Florida's one-call center charged with helping prevent damages to underground utilities. To do this, it educates excavators on calling 811 and answers that call so utility companies know about your digging project. For the excavator, calling 811 helps prevent hefty fines and repair costs due to utility service outages, injuries, environmental contamination and property damage.

811 Know what's below. Call before you dig.

b) The Underground Facility Damage Prevention and Safety Act, Chapter 556 in the Florida Statutes was adopted in 1993. It requires anyone digging to call 811 first so underground utility lines can be located and marked. The result is so excavators know the approximate location of buried lines and can take necessary precautions to avoid them while digging. Any local or state law enforcement officer, government code inspector, or code enforcement officer in Florida can enforce this law.

4. Surface Encumbrances.

a) Before beginning excavation, establish the locations of overhead utilities and any surface encumbrances. These include utility poles, buildings, roadways, sidewalks, pipe supports, trees, or any load bearing structure. Remove or support all surface encumbrances, as necessary, to safeguard employees.

b) Additional underpinning, shoring or bracing may be required when adjoining utility lines, foundations, walls and footings are endangered.

5. Determination of Soil Type.

a) Trench collapses can occur without warning, regardless of the depth. The vast majority of trenching fatalities occurs in trenches 5 to 15 feet deep. These depths invite taking chances, but trench cave-ins don't have to happen.

b) Soil and rock deposits are categorized into four types:

  I. Stable Rock is natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed. It is usually identified by a rock name such as granite or sandstone.

  II. Type A Soils are cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) (144 kPa) or greater. Examples of Type A soils are often: clay, sandy clay, clay loam.

    A. No soil is Type A if it is fissured, is subject to vibration of any type or has previously been disturbed.

  III. Type B Soils are cohesive soils with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa). Examples of other Type B soils are: angular gravel; silt; silt loam; previously disturbed soils unless classified as Type C;

  IV. Type C Soils are cohesive soils with an unconfined compressive strength of 0.5 tsf (48 kPa) or less. Type C soils include granular soils such as gravel, sand and loamy sand, submerged soil, soil with water freely seeping, and submerged rock that is not stable.

c) A competent person using testing equipment and who has received the proper training is needed to determine soil types of Solid Rock, Type A or Type B, otherwise Type C soil will be used.

6. Requirements for Protective Systems.

a) When employees work in trenches more than 5 feet deep, the employer must protect them from cave-ins by using an adequate protective system.

Note: Many FPP facilities require a protective system at 4 feet in depth or greater.

b) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

c) Protective systems include Shoring, Trench Shields and Sloping.

d) Whichever protective system you use, back fill excavations upon completion.

7. Shoring Types.

a) Shoring is the provision of a support system for trench faces used to prevent movement of soil, underground utilities, roadways, and foundations.

b) Shoring is used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. Shoring systems consist of posts, wales, struts, and sheeting.

c) There are two basic types of shoring, timber and aluminum hydraulic or pneumatic.

   I. Hydraulic Shoring: A prefabricated strut and/or wale system manufactured of aluminum or steel. Hydraulic shoring provides a critical safety advantage over timber shoring because workers do not have to enter the trench to install or remove hydraulic shoring.

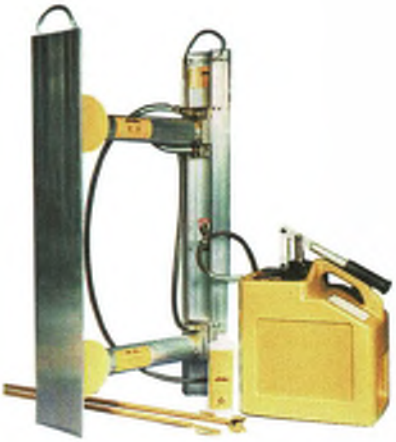
   II. Pneumatic Shoring works in a manner similar to hydraulic shoring. The primary difference is that pneumatic shoring uses air pressure in place of hydraulic pressure. A disadvantage to the use of pneumatic shoring is that an air compressor must be on site.

d) All Shoring should be installed from the top down and removed from the bottom up unless they are installed and removed from outside the trench.

e) Extend shoring to the bottom of the trench and no less than 18 inches above the vertical part of the trench face.

f) Do not work between shoring protection and the unprotected walls of the trench.

g) Timber shoring should not be used when trench walls are unstable since employees must enter before the shoring is built.



8. Shielding Types.

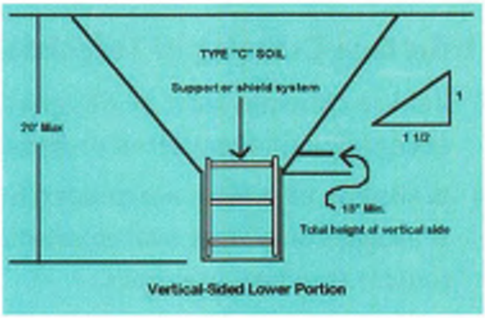
a) The primary function of Trench Boxes or Trench Shield is to protect workers from cave-ins and similar incidents. This differs from shoring whose purpose is to shore up or otherwise support the trench face.

b) The excavated area between the outside of the trench box and the face of the trench should be as small as possible. The space between the trench boxes and the excavation side are backfilled to prevent lateral movement of the box.

c) When used in conjunction with sloping, the box should extend no less than 18 inches above the vertical part of the trench face.

d) When portable trench boxes are stacked, provide attaching means to prevent them from separating.

e) Do not allow employees in shields during their installation, removal or relocation.



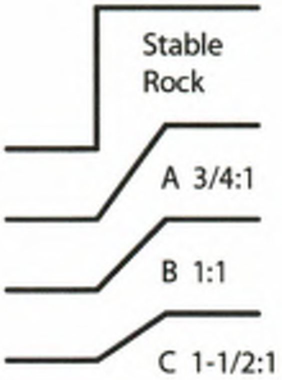
9. Sloping and Benching.

a) A sloping system means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins.

b) A benching system means excavating the sides of an excavation to form one or a series of horizontal levels or steps.

c) A registered professional engineer is required to design sloping or benching for excavations greater than 20 feet deep or when benching in type C soil.

d) Spoil pile must be at least two feet from edge of trench.



ALLOWABLE SLOPES

Soil type	Height/Depth ratio	Slope angle
Stable Rock	Vertical	90°
Type A	¾:1	53°
Type B	1:1	45°
Type C	1½:1	34°
Type A (short-term)	½:1	63°

(For a maximum excavation depth of 12 ft.)

10. Competent Person.

a) Must have a competent person on-site who is capable of identifying existing and predictable hazards and has the authority to take prompt corrective action.

b) A competent person should be able to identify soil classifications (or use Type C soil) and the protective systems such as sloping, shoring or shielding.

c) A competent person must make ongoing daily inspections of excavations, adjacent areas and protective systems, including after every heavy rainfall or other hazard producing occurrences.

11. Surface Crossing of Trenches.

a) Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.

b) Walkways or bridges are needed for foot traffic over excavations. Walkways or bridges over excavations greater than 4 feet deep require standard guardrails.

12. Ingress and Egress.

a) Trenches 4 feet or more in depth should be provided with a fixed means of egress.

b) Spacing between ladders or other means of egress must be such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress.

c) Ladders must be secured and extend a minimum of 3 feet above the landing.

d) Excavations deeper than 4 feet and have limited egress maybe considered confined spaces.

13. Exposure to Vehicles.

a) Employees exposed to public vehicular traffic must wear suitable garments marked with or made of reflectorized or high-visibility material.

b) Require a designated, trained flag person along with signs, signals, and barricades when excavations are along roadways.

14. Exposure to Falling Loads.

a) Employees must be protected from loads or objects falling from lifting or digging equipment. Procedures designed to ensure their protection include:

b) Employees are not permitted to work under raised loads.

c) Employees are required to stand away from equipment that is being loaded or unloaded.

d) Equipment operators or truck drivers may stay in their equipment during loading and unloading if the equipment is properly equipped with a cab shield or adequate canopy.

e) Spoil pile and other material that could fall into the excavation must be at least two feet from edge of trench.

15. Warning Systems for Mobile Equipment.

a) Steps should be taken to prevent vehicles from accidentally falling into the trench. Use one or a combination of the following:

   I. Barricades.
   II. Hand or mechanical signals.
   III. Stop logs must be installed if there is a danger of vehicles falling into the trench.
   IV. Soil should be graded away from the excavation; this will assist in vehicle control and channeling of run-off water.

16. Hazardous Atmospheres.

a) When hazardous atmospheric conditions exist or you can reasonably expect them to exist, test and control the atmosphere to prevent exposure to harmful levels.

b) If hazardous atmospheric conditions cannot be controlled by ventilation, respirators must be worn.

c) Emergency rescue equipment is required when a hazardous atmosphere exists or can reasonably be expected to exist. Requirements are as follows:

   I. Respirators must be of the type suitable for the exposure. Employees must be trained in their use and a respirator program must be instituted.
   II. Harness and lifelines must be provided when employees enter bell-bottom pier holes, deep confined spaces, or other similar hazards.

17. Standing Water and Water Accumulation.

a) Methods for controlling standing water and water accumulation must be provided and should consist of the following if employees are permitted to work in the excavation:

b) Use of special support or shield systems approved by a registered professional engineer.

c) Water removal equipment, i.e. well pointing, used and monitored by a competent person.

d) Safety harnesses and lifelines used in conformance with 29 CFR 1926.104.

e) Surface water diverted away from the trench.

f) Employees removed from the trench during rainstorms.

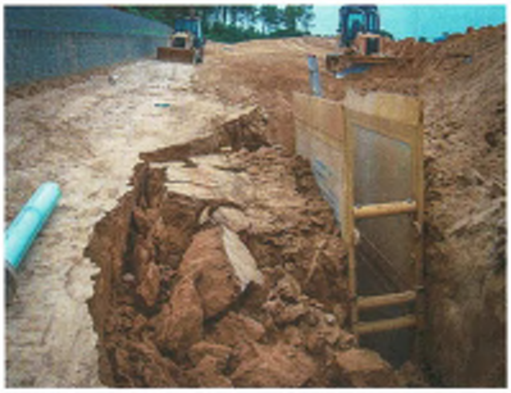
g) Trenches carefully inspected by a competent person after each rain and before employees are permitted to re-enter the trench.

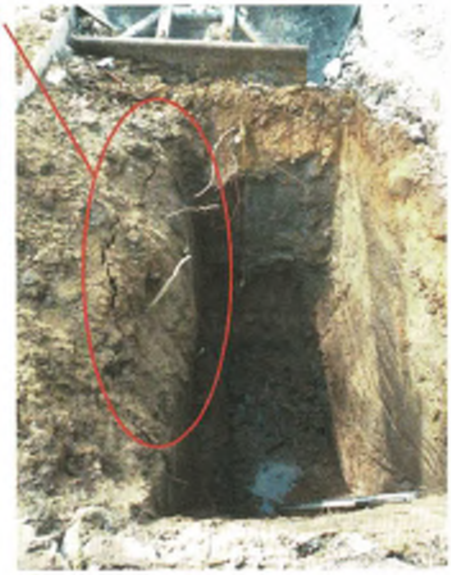
18. Inspections.

a) Inspections shall be made by a competent person and should be documented.

b) The following guide specifies the frequency and conditions requiring inspections:

   I. Daily and before the start of each shift;
   II. After every rainstorm;
   III. When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur;
   IV. When there is a change in the size, location, or placement of the spoil pile; and
   V. When there is any indication of change or movement in adjacent structures.





Fissure identified by Compliance Officer. Entire area around fissure collapsed into trench within minutes of initiating the inspection.

EXCAVATION REVIEW

1. Contactors must contact site management to identify specific excavation requirements prior to arriving on site to perform work. Depending on the site, if digging deeper than one or two feet, an Excavation Permit must be completed.

    [✓ A. True]
    B. False

2. A Competent Person must be used to help determine what underground utilities are located in the area before digging begins. Many FPP facilities require manual digging when the depth is unknown or when within how many feet of the line, pipe or cable?

    A. One foot
    B. Two foot
    [✓ C. Three foot]
    D. Four foot

3. What is considered to be a surface encumbrance that may require additional support? (Circle all that are correct)

    [✓ A. Utility poles]
    B. Grass and small bushes
    [✓ C. Building]
    D. Motor vehicle
    [✓ E. Road]

4. At what depth do many FPP sites require a protective system such as shoring, shielding or sloping?

    A. 4 ft. (5ft. for OSHA).

5. In order to prevent material, equipment and dirt from falling into the excavation or trench, it should be placed how far away from the edge? 2 ft.

6. Trenches 4 ft. feet or more in depth should be provided with a ladder to exit and spacing should be the worker will not have to travel more than 25ft. feet laterally to reach it.

7. Inspection must be conducted by a Competent Person when?

    [✓ A. Daily and before the start of each shift.]
    [✓ B. After every heavy rainstorm.]
    [✓ C. When fissures, tension cracks, or sloughing occur.]
    [✓ D. When there is a change in the size, location, or placement of the spoil pile.]
    [✓ E. All the above answers are correct.]

SCAFFOLD SAFETY

OSHA 29 CFR 1926.451 and ANSI A10.8

1. Scope.

The following are some basic safety requirements and practices for the design, construction, maintenance, inspection, use, and dismantling of supported scaffold in the work place. Supported scaffolds are scaffolds that are in contact with the ground rather than being suspended by cables. Examples are fabricated frame, mobile and ladder jack scaffolds.

2. Hazards Related to Scaffold Use.

Each year, there are more than 4,500 injuries and 60 deaths stemming from scaffold-related incidents. In a Bureau of Labor and Statistics (BLS) study, 72% of workers injured in scaffold accidents attributed the accident either to the planking or support giving way, or to the employee slipping or being struck by a falling object.

a) Common Causes of Scaffolding Injuries.

  I. Electrocution—working too close to overhead powerlines.
  II. Improper installation—if a scaffold is improperly installed, the scaffold may collapse.
  III. Defective components used to erect scaffold—if built with faulty or defective materials, a scaffold may collapse.
  IV. Improper Access—No safe access is available and falls occur while climbing scaffold.
  V. Wrong Components/Mixing Parts—if built with materials not specifically designed by manufacturer for scaffolding device may fail.
  VI. Excess Weight—when manufacturer weight limits are not followed employees put themselves at risk.
  VII. Slippery Surfaces/Bad Weather—high wind, rain and slippery surfaces can lead to falls from scaffolding.
  VIII. Falls—fall protection not used when building, dismantling or when using the scaffold.

3. Definitions.

Competent Person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Qualified Person: One who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project. As this relates to "design," the Qualified Person is one who has the ability to determine the type of scaffold needed for a particular job, to include safe loading of the scaffold system in accordance with the design requirements of ANSI and the manufacturer.

4. Scaffold Selection.

a) A Qualified Person is required to determine the type of scaffold necessary for the job.

b) A Competent Person is required to supervise and direct scaffold work relating to erecting, dismantling, maintaining, and repairing.

c) Registered professional engineer shall deign any tube and coupler and tubular welded frame scaffolds over 125 feet in height, pole scaffolds over 60 feet in height, and all outrigger beam scaffolds and their components.

d) Factors to consider when selecting the scaffold:

  I. Any special features of the building structure in relationship to the scaffold;

  II. Length and kind of work tasks to be performed;

  III. Weight of loads to be supported;

  IV. Hazards to people working on and near the scaffolding.

e) Scaffolds must be structurally capable of supporting without failure its own weight and at least 4 times the maximum intended load applied/transmitted.

5. Scaffold Inspection.

a) A Competent Person is required to inspect the scaffold and its components for physical defects following:

  I. Completion of erection or structure modification;

  II. Prior to each work shift when using scaffolds for construction activities;

  III. Any occurrence that may have affected the scaffold's structural integrity.

b) A standardized Scaffold Inspection Tag shall be affixed near the access point.

c) Tags may use a color code system:
   - I. Green or white for all safety systems are in place.
   - II. Yellow for caution should be used and certain safety precautions are needed.
   - III. Red for danger and should not be used.

6. Planking and Working Platforms.

a) For wood scaffold planking, scaffold grade lumber or equivalent shall be used.

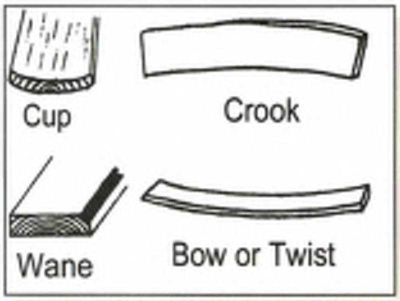
b) Minimum and maximum permissible spans for 2 inch by 10 inch or wider wood planks shall be followed:

	Full Thickness Undressed Lumber			Nominal Thickness Lumber		
Working Load (p.s.f.)	25	50	75	25	50	**
Permissible Span (ft.)	10	8	6	8	6	**

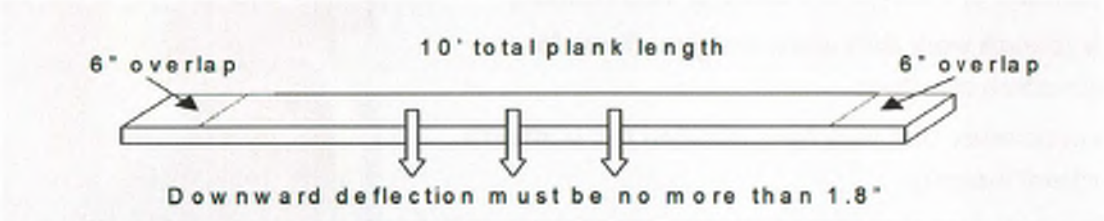
** Nominal thickness lumber is not recommended for heavy duty use.

Because nominal thickness lumber is not cut to its exact dimensions, nominal 2 x 10 is really more like 1½ x 9¼. As a result, it does not have the same load-bearing capacity of full thickness lumber.

c) Wood planks are damaged if they have:
   - I. Rot or powdery appearance from termite damage;
   - II. Cupping of 3/8" or more on a 10" wide or 1/2" or more on 12" wide plank;
   - III. Crook of more than 5/16";
   - IV. Bow of more than 7/16";
   - V. Twist of more than ¾" on a 10' long;
   - VI. Split that has a length of 1 ½ times the board width or more.
   - VII. Knots that are more than 1 ½" diameter if loose or 2" diameter if tight on a 10" plank.



d) Planks must not deflect more than 1/60 of span when loaded.



e) Each working level must be fully planked with no more than 1" gaps between planks. However planks can be up to 9 ½" away from the upright if additional space around the uprights is needed.

f) Each working level must be at least 18" wide. Exception if for ladder jack, pump jack, top plate bracket or roof bracket type scaffold; must be at least 12" wide.

g) Extend planks over the supporting members at least 6" unless you have tied the plank or use cleats or hooks on the underside.

h) Planks must not extend more than 12" over the end support for 10' or less plank or 18" for planks longer than 10' because you could flip the plank up if you step on the extension.

i) Overlap planks between sections of scaffold by at least 12" and only over a supporting bearer.

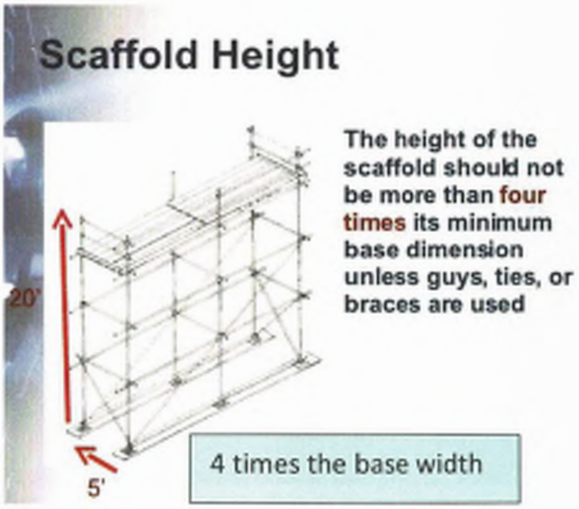
  I. Overlap can be less if planks are secured with cleats or tie wires.
  II. You can butt planks if each has their own support and are tied or hooked.

7. Base and Supports.

a) Mud sills of adequate size/dimension and secured to each base plate may be necessary, if used on sand, clay, gravel, asphalt, etc. and even thin concrete.

b) Scaffolds shall stand plumb and level, and rest upon base plates (stationary scaffold), and other adequate firm foundation (cement, steel, etc.).

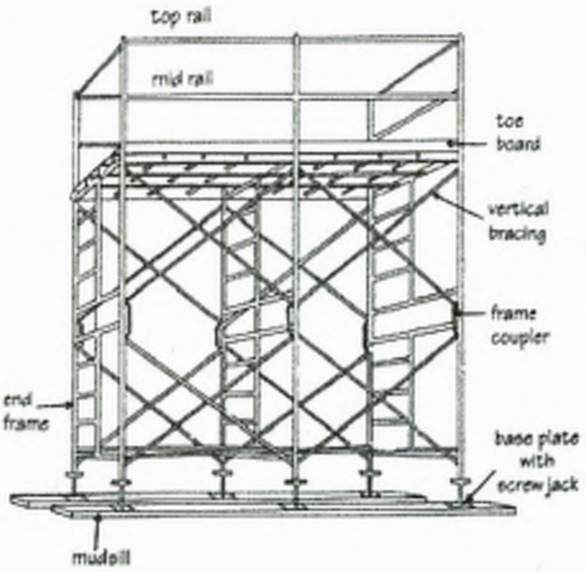
c) Scaffolds shall be guyed, tied, or otherwise braced when the scaffold's height exceeds 4 times its smallest base dimension. Securing is to be repeated every 26 feet vertically and 30 feet horizontally.



Scaffold Height

The height of the scaffold should not be more than four times its minimum base dimension unless guys, ties, or braces are used

4 times the base width



8. Fall Protection and Fall Hazards.

a) Scaffold Erectors must use fall protection during scaffold erection activity when feasible.

b) Scaffold Users must have fall protection when a working platform is 10 feet or more above a lower level. Note many facilities require it at 4 feet. A complete guard railing system or personal fall arrest system can be used.

   I. A complete guard railing system is top rail, mid rail, toe board and entrance opening (e.g., ladderway access) which can be closed by way of a gate or approved safety chain/cable assembly or similar.

      A. Cross bracing is acceptable in place of a mid rail when the crossing point of two braces is between 20 inches and 30 inches above the work platform.

      B. Cross bracing can be used as a top rail when the crossing point is between 38 inches and 48 inches above the work platform.

      C. Cross bracing cannot be used in place of both top rail and mid rail at the same time.

   II. Scaffold frames and railings must not be used as anchor points for fall arrest systems unless the scaffold was designed for such use. Most guard rails only meet a 200 pound rating.

c) If fall protection is provided by the structure on which the work is being performed (e.g., building or wall), no more than 14 inches between the scaffold platform and the structure is allowed.

d) Mesh screens, intermediate vertical members or solid panels should be used to safeguard employees and the public at lower levels shall be installed where the potential for materials/objects falling from overhead to a lower level exists.

e) Prohibiting entry into the fall hazard area by using barricades and signs.

f) Remove debris and unnecessary materials from scaffold platforms.

9. Access.

a) Access can be provided by portable ladder, hook-on ladders; attachable ladders; stairway-type ladders; integral prefabricated scaffold rungs; direct passage from another scaffold, structure or personnel hoist.

b) The bottom steps of ladders must not be more than 2 feet from the supporting level.

c) When direct access is used, spacing between scaffold and another surface should be no more than 14 inches horizontally and 2 feet vertically.

d) Cross braces and scaffold frames shall not be used to access scaffold platforms unless they are equipped with a built-in ladder specifically designed for such purpose.

e) Ladders must extend a minimum of 3 feet above the platform surface.

10. Mobile Scaffold.

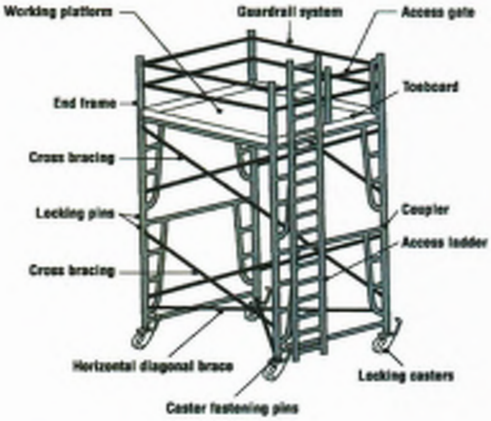
a) Mobile scaffolds are to be used on firm level surfaces, with casters or wheels locked before using.

b) Manual movement of mobile scaffolds is to be accomplished by applying force as close to the base as practical.

c) An employee shall be permitted to "ride" on a mobile scaffold while it is being moved only under the following circumstances:

   I. The surface upon which the scaffold is being moved is within 3 degrees of level, and free of pits, holes, and obstructions.

   II. The height-to-base width ratio of the scaffold is 2 to 1, or less.



11. Training.

a) Employees who perform work while on a scaffold are required to complete a scaffold user training course.

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SCAFFOLD REVIEW

1. What is the name of the person required to supervise and direct scaffold work relating to erecting, dismantling, maintaining, and repairing?

   A. Competent Person.

2. Scaffolds must be structurally capable of supporting its own weight and at least 6 times the maximum intended load.

   A. True
   [✓ B. False] 4 times max intended load.

3. A Competent Person is required to inspect the scaffold and its components for physical defects following? (Circle all that are correct)

   [✓ A. After completion of building the scaffold]
   [✓ B. After modification]
   C. After dismantling the scaffold
   [✓ D. Prior to each work shift]
   E. After each rain storm

4. Finish the following sentences.

A. Except for ladder jack scaffold, each working level must be at least 18" wide.
B. Each working level must be fully planked with no more than 1" gaps between planks.
C. Planks should extend over the supporting members at least 6" unless you have tied the plank or use cleats.

5. Scaffolds shall be secured when the scaffold's height exceeds 4 times its smallest base dimension?

6. Mesh screens or similar barrier must be used where the potential for materials falling from overhead to a lower level exists. 8. d) should vs must

   [✓ A. True]
   B. False

7. Cross bracing is prohibited from being used as a form of fall protection such as a top rail?

   A. True
   [✓ B. False]

LADDER SAFETY

OSHA 29 CFR 1910.26 & 1926.1053, ANSI A14.1, 2 & 5-2000

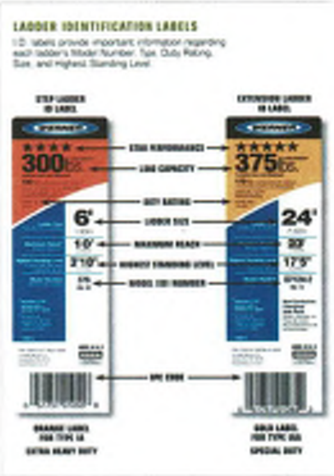
1. Ladder Selection

a) Take the time to get the right size and type of ladder.

- I. Must be long or tall enough to safely reach the work area.
- II. Have a load rating that can support the weight of the user, materials and tools.
- III.

Ladder Type	Duty Rating	Description
Type 1AA	375 lb.	Special Heavy-duty industrial
Type 1A	300 lb.	Extra Heavy-duty industrial
Type 1	250 lb.	Heavy-duty industrial
Type 2	225 lb.	Medium-duty commercial
Type 3	200 lb.	Light-duty household

- IV. Made of the best material for the job:



b) Wood

- I. Non-conductor of electricity but only when dry.
- II. Best natural insulator against heat.
- III. Ages very fast and can hide defects.

Note: many facilities have banned the use of wooden ladders.

c) Aluminum

- I. Conductor of electricity.

Note: many facilities have banned the use of aluminum ladders.

d) Fiberglass

- I. Non-conductor of electricity.
- II. Dense material and is slower to conduct heat than metals.
- III. Ages very slowly.

2. Inspection.

a) Inspect ladders before use for the following:

- I. The duty rating sticker on the side of every ladder so users can determine if they have the correct type ladder for each task/job.
- II. Rungs free of oil, grease and other slipping hazards.
- III. Joints between steps or rungs and side rails are tight.
- IV. Steps and rungs are not bent or cracked.
- V. Slip-resistant feet are in good condition.
- VI. No part is warped or splintered on wooden ladders.
- VII. Cracks in side rail.

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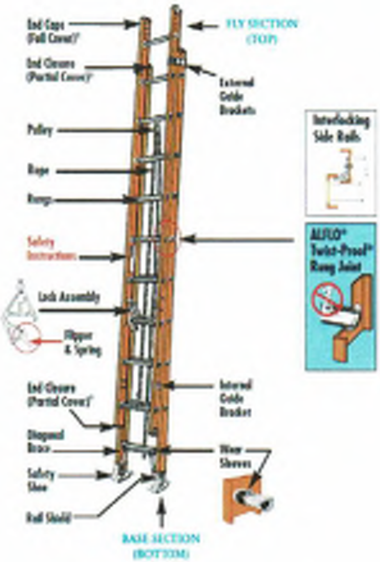
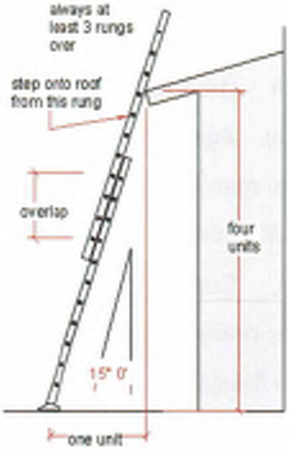


  - VIII. Spreader bar not damaged and locks in place on step ladders.
  - IX. Ropes are not frayed or badly worn on extension ladders.
  - X. Feet swivel on extension ladders.
  - XI. Extension locking mechanism works properly on extension ladders.
- b) Ladders that have developed defects shall be removed from service for repair or destruction; and tagged or marked "Do Not Use"
- c) In addition to the before use inspection, a qualified person should inspect ladders for defects frequently. The frequency is determined by use. Some employers may choose monthly while other choose every 12 months.

3. General Set Up.



- a) Place on a secure and level footing.
- b) Straight or extension ladders:
  - I. Placed with the two rails supported equally, unless a single support attachment is provided and used.
  - II. Secured in place as to prevent slipping such as tied, blocked, or held.
  - III. Distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder also known as 4:1 ratio.
  - IV. Side rails shall extend not less than 36 inches above the upper landing surface.
  - V. If on soft surface, place spikes and seat the ladder in the ground.
  - VI. Raise extension so that the upper section overlaps and rests on the bottom section.
- c) Step ladders:
  - I. Ensure legs are fully extended and spreader bar is locked in place.

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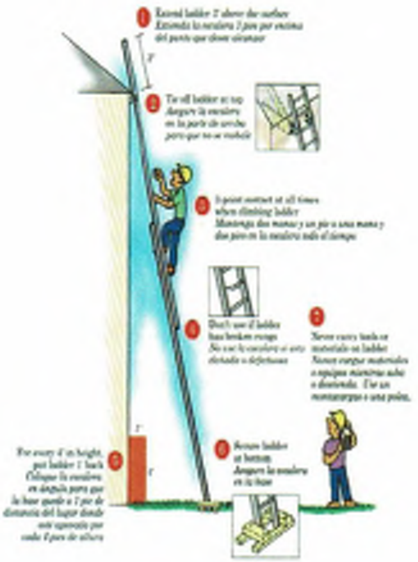
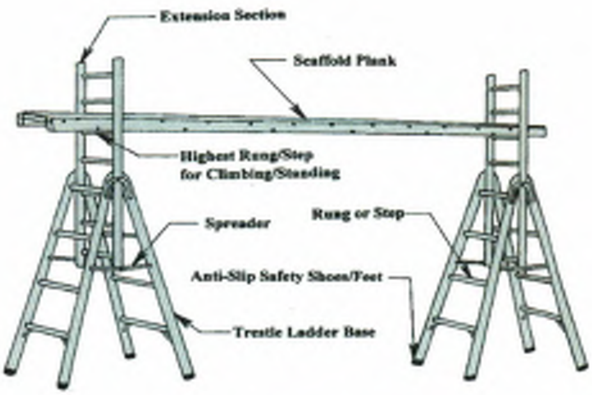

Extend ladder 3' above the surface
Tie off ladder at top
3-point contact at all times when climbing ladder
Don't use if ladder has broken rungs
Never carry tools or materials on ladder
Secure ladder at bottom
For every 4' in height, put ladder 1' back

4. General Safe Use.

a) Maintain three-point contact at all times.
b) Only take one step at a time.
c) Hold the side rails not the rungs when climbing.
d) Use a tool belt to keep hands free or lift material using a hand line and rated bucket.
e) Only use a ladder for the purpose for which it is designed.
f) Always face the ladder when ascending or descending.

5. Do Not.

a) Place the ladder on top of other objects to increase height.
b) Place in front of doorways unless adequate safety measures are in place.
c) Let anyone else use a ladder while you are unless designed for two.
d) Move, shift, or extend a ladder while it is occupied.
e) Overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails.
f) Carry any object that may cause you to lose balance or fall.
g) Stand on the rungs that are above the support when using a straight ladder.
h) Paint wooden ladders.
i) Use the top cap or the rung below it for standing or stepping on a step ladder.
j) Use a step ladder as a straight ladder.
k) Place on boxes, barrels or other unstable objects.
l) Used in a horizontal position as platforms, runways, or scaffolds unless designed for such use.



Extension Trestle Ladder
(often used in pairs to support a scaffold plank)

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LADDER REVIEW

1. FPP facilities require you to use the correct length, type and size ladder. Which of the following ladders is acceptable?

   A. A fiberglass portable ladder with a missing load rating label.
   B. A Type 1 - 250 lb. rated heavy-duty industrial wooden ladder for a 230 pound person.
   C. A Type 2 - 225 lb. rated medium-duty fiberglass ladder for a 230 pound person.
   [✓ D.] A Type 1 - 250 lb. rated heavy-duty industrial fiberglass ladder for a 230 pound person.
   E. A Type 1A - 300 lb. rated extra heavy-duty industrial metal ladder for a 230 pound person.

2. Ladders must be inspected before use for several safety concerns. Ladders with defects shall be removed from service by doing what?

   A. Tagged or marked "Do Not Use"

3. Finish the following sentences.

A. Straight ladders should be Secured in place to prevent slipping or tipping.
B. Using the 4:1 Ratio will ensure you set up the straight ladder at the proper angle.
C. Side rails shall extend no less than 36" above the landing surface.

4. Which of the following are considered **UNSAFE ACTS**? (Circle all that are correct)

   [✓ A.] Carrying objects that prevent using three points of contact.
   B. Reaching out to the side of the ladder no further than your belt buckle.
   [✓ C.] Being in a hurry while using the ladder.
   D. Barricading the door or entry way when placing a ladder near the door.

5. It is acceptable to use a ladder for something other than its intended purpose if you are very careful and you have a safety watch.

   A. True
   [✓ B.] False

6. Standing on the rung just below the top cap on a step ladder is allowed since you are required to use heavy duty fiberglass ladders?

   A. True
   [✓ B.] False

Ladders → Fiberglass only @ FPP Sites

FIRE PREVENTION AND CONTROL

1. General Rules.

a) Smoking or use of an open flame is prohibited where flammable or combustible liquids, including greases, or flammable gases are used, stored or handled.

b) Readily visible signs prohibiting smoking and open flames shall be posted where a fire or explosion hazard exists.

2. Transfer & Dispensing Flammable Or Combustible Liquids Class I And II.

a. Internal combustion engines shall be switched off before refueling if the fuel tanks are integral parts of the equipment. Mobile equipment must be placed in park. Many FPP facilities also require the parking brake applied.

b. When fueling equipment that have exposed hot engine parts, allow time for it to cool.

c. Pumps, gravity flow or hydraulic displacement are normally used to transfer flammable and combustible liquids.

d. Transfer by compressed air is prohibited.

e. Dispense fuels only in well ventilated areas.

f. The preferred method of dispensing liquids from drums is a hand pump through a down leg

g. Gravity dispensing requires an approved self-closing faucet and drum vents

h. Bonding and grounding is required for transfer and dispensing of **flammable liquids**.

I. There must be a bonding connection between storage container and container being filled. This may be integral in pumps with self-bonding hoses.

3. Housekeeping.

a. Flammable or combustible liquid spillage or leakage shall be removed in a timely manner or controlled to prevent a fire hazard.

b. Contractor employees are not to enter flammable storage areas unless they are assigned to perform a job or task within the flammable storage area.

c. Contractor employees who enter our flammable storage areas to perform tasks or jobs will remove all scrap materials, rags, boxes, papers, wood, pallets, and any other materials as soon as possible.

d. Until disposed of property, waste or rags containing flammable or combustible liquids that could create a fire hazard shall be placed in covered metal containers or other equivalent containers with flame containment characteristics.

4. Safety Cans.

a. Small quantities of flammable liquids drawn from storage shall be kept in safety cans labeled to indicate the contents.

b. Safety Cans must be made to meet FM and UL requirements.

c. Safety cans may be either TYPE I, (pouring spout) TYPE II, (flexible metal hose) and should be made only of metal unless a specific chemical requires the use of a plastic or glass container.

Note: some FPP facilities require either a metal or plastic spout used.

d. For satellite storage of gasoline, OSHA limits the size of the container to two gallons and for diesel fuel the limit is five gallons.

e. Motor oils and turbine oils are class IIIB liquids and must be stored in appropriate containers.

f. Flammable liquids in the work area should be limited to the amount needed for daily operation.

g. Bring only the amount of flammable liquids to the job area required for the task or job for your shift.

5. Flammable Liquid Storage Requirements.

a. Flammable & combustible liquids come in a variety of containers such as tanks, drums, pails, cans, aerosol cans.

b. There are three storage types used. Outside storage which is generally used for tanks and sometimes drums, storage rooms or storage cabinets used for smaller containers.

c. Flammable storage cabinets:

  I. Must be approved fire resistant cabinets;

  II. Labeled ***"Flammable-Keep Fire Away"***;

  III. Portable fire extinguishers must be located a minimum of ten (10) feet and a maximum of twenty-five (25) feet from the cabinet area;

  IV. Not more than 60 gallons of Class I or Class II liquids in one cabinet;

  V. Not more than 120 gallons of Class III liquids; and

  VI. Not more than 120 gallons of Class I, II, and Class IIIA liquids total.

d. Outside container storage:

I. Have no greater volume than 1,100 gallons of a Class IA flammable. Additional storage capacity is allowed as the class decreases in hazard.

II. Signs must be posted to identify and warn, ***"Flammable Liquid Danger, No Smoking or Open Flame Within 20 Feet"***; and

III. Portable fire extinguishers must be within 75 feet of storage area.

e. Flammable & combustible liquids containers must be closed when not in use.

f. Flammable liquids must have means to vent their vapor pressure.

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FIRE EXTINGUISHER EQUIPMENT

1. General Requirements.

a. For fighting fires that could endanger persons, facilities have onsite firefighting equipment for fighting fires in their early stages.

b. This onsite firefighting equipment shall be:

- I. Of the type, size, and quantity that can extinguish fires of any class which could occur as a result of the hazards present; and
- II. Strategically located, readily accessible, plainly marked, and maintained.

2. Mobile Equipment.

a. Most FPP facilities require a minimum of a 5 pound ABC fire extinguisher on mobile equipment used to perform work.

3. Selection.

a. The selection of portable fire extinguishers is based primarily on the type of fire most likely to be encountered in the building. NFPA 10 defines the five types of fire classes:

- I. **Class A:** Fires involving ordinary combustible materials, such as wood, cloth, paper, rubber, and most plastics. This is the type of fire that would occur in most building conditions.

- II. **Class B:** Fires involving flammable and combustible liquids, petroleum-based materials, paints, solvents, alcohols, and flammable gases. This type of fire would likely occur where such materials are used, dispensed, or stored.

- III. **Class C:** Fires involving energized electrical equipment. In addition to building electrical service equipment, this type of fire could occur with electric equipment, such as computers and copiers.

- IV. **Class D:** Fires involving combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium.

- V. **Class K:** Fires in cooking appliances involving combustible cooking materials, such as vegetable or animal oils and fats.

b. Only water-type extinguishers shall be installed in areas containing oxidizers. Multipurpose dry chemical fire extinguishers shall not be installed in areas containing oxidizers.

c. Portable fire extinguishers are also required within 20 feet of a charging station for electric-powered industrial vehicles (for example, forklifts).

4. Labeling.

a. The UL rating is broken down into Class A and Class B:C ratings. These numerical ratings allow you to compare the relative extinguishing effectiveness of various fire extinguishers. For example, an extinguisher that is rated 4A:20B:C indicates the following:

- I. The A rating is a water rating. Each A is equivalent to 1.25 gallons of water. 4A = 5 gallons.
- II. The B:C rating is equivalent to the amount of square footage that the extinguisher can cover, related to the degree of training and experience of the operator. 20 B:C=20 sq. ft. of coverage.
- III. C indicates it is suitable for use on electrically energized equipment.
- IV. Operating instructions shall be located on the front of the extinguisher and shall be clearly visible.

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5. Location & Installation.

a. The requirements state that portable fire extinguishers shall be located along normal paths of travel, in conspicuous locations that are readily accessible, and are not obstructed or obscured from view.

b. Where extinguishers have unavoidable partial visual obstruction, signage or other methods of indicating the location shall be provided.

c. Hand-held portable fire extinguishers must be installed in a hanger or bracket specifically designed or approved for the type of extinguisher, or they must be housed in a cabinet.

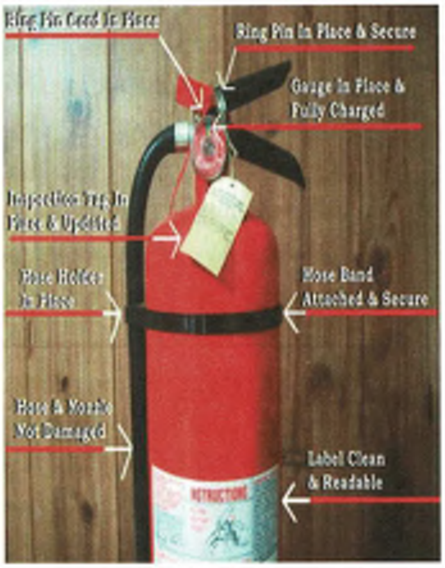
d. In no case shall an extinguisher be installed with the bottom of the extinguisher less than 4 inches above the floor.

6. Inspection and Maintenance.

a. Fire extinguishers on mobile equipment shall be part of the daily or pre-use inspection.

b. All fire extinguishers require a more detailed inspection at approximately 30-day intervals.

c. 30 day inspection of fire extinguishers shall include a check of at least the following items:


Ring Pin Cord In Place
Ring Pin In Place & Secure
Gauge In Place & Fully Charged
Inspection Tag In Place & Updated
Hose Holder In Place
Hose Band Attached & Secure
Hose & Nozzle Not Damaged
INSTRUCTIONS
Label Clean & Readable

- I. Located in designated place;
- II. Is properly hung with the proper manufacturer's hanger;
- III. No obstruction to access or visibility;
- IV. Operating instructions on nameplate legible and facing outward.
- V. Pressure gauge reading or indicator in the operable range or position.
- VI. Fullness determine by weighing or hefting for self-expelling-type extinguishers (CO2), cartridge-operated extinguishers and pump tanks.
- VII. Pin and seals are in place.
- VIII. Extinguishers show no visual sign of damage or abuse.
- IX. Nozzles are free of blockage.
- X. Check that the last hydrostatic test date is within code requirements.
- XI. Check the last 6–year maintenance inspection date if applicable.
- XII. Check the valve and shell for damage or corrosion.
- XIII. For dry chemical extinguishers, fluff the powder by turning the unit.
- XIV. For wheeled units check tires, wheels, carriage, hose, and nozzle

d. Records of the inspection must be kept indicating the date the inspection and the initials of the person performing the inspection.

e. Records shall be kept to demonstrate that at least the last 12 monthly inspections have been performed.

f. A tag or sticker must indicate the date of the last annual inspection of the fire extinguisher by a state certified extinguisher inspector.

7. Training.

Where the employer has provided fire extinguishers for employee use, the employer shall provide an educational program to familiarize employees on the principles and use of the extinguishers. This educational program should be completed during the initial hiring and annually thereafter.

FIRE PREVENTION REVIEW

1. What is not allowed where flammable and combustible liquids and gases are stored or used?

   A. Smoking or open flame.

2. When fueling a combustion engine machine or equipment, what must be done before fueling?

   A. turn off, use Park Brake, allow to cool.

3. What type of fluid requires bonding and grounding when transferring or dispensing? (Circle all that are correct)

   [✓ A. Gasoline]
   B. Diesel fuel
   C. Oil
   [✓ D. Flammable liquid]

4. Waste or rags containing flammable or combustible liquids that could create a fire hazard shall be placed where?

   A. Metal garbage cans
   B. Plastic garbage cans
   C. In bed of pick up
   [✓ D. Covered metal container made for such items]

5. Small quantities of flammable liquids drawn from storage shall be kept in safety cans. Finish the following sentences.

A. Safety cans should be made of Metal — Properly Labeled.
B. Many FPP facilities require a metal or plastic Spout.
C. Gasoline should be placed in a 2 gallon size safety can. + Fire Retardant Screen.
5 gallon for Diesel

6. Many times a job or task may take several days to complete. Which sentence is correct?

   A. Contractors can bring out as much flammable liquids as they need for the entire job.
   [✓ B. Contractors can bring out as much flammable liquids as they need for the task for their shift.]

7. Contractors are allowed to bring more than the one days' worth of flammable and combustible liquids if they properly store them. What are the three main storage types?

   A. Outside Storage.
   B. Storage Cabinets.
   C. Storage Rooms.

8. Most FPP facilities require a 5 pound multipurpose fire extinguisher mounted in a readily available location in or on any vehicle used to perform work in the facility?

   [✓ A. True]
   B. False

All Extinguishers Inspected
- Daily on mobile equip
- Monthly by trained
- Annually by State cert. Insp.

TOC

MOBILE EQUIPMENT

1. Facility General Safety Policies.

a. Use of your personal vehicle **IS NOT PERMITTED** at most chemical sites in the phosphate industry.

b. Company vehicles should be identified with company name.

c. Before driving on chemical plant property **ALWAYS** obtain approval from the site operator.

d. Park only in the areas designated for **CONTRACTOR PARKING**.

e. Leave key in vehicle when parked inside facility.

f. Never follow too close behind heavy mobile equipment. Some FPP facilities require a 100 foot buffer zone.

g. Do not pass heavy mobile equipment without prior notification to the operator such as a horn or flashing your head lights.

h. Maintain three points of contact when using ladders to access mobile equipment.

i. Caution should be used when accessing truck beds to prevent falling.

j. Stow all carry-on items securely to prevent injuries from sliding or flying objects.

k. Always keep all body parts (head and limbs) inside the vehicle.

l. Wear Personal Protective Equipment (hat, glasses, and toe protected boots) while riding in open cab vehicles or when windows are rolled down in closed cab vehicles.

m. Assure that "Safety Data Sheets" accompany deliveries of chemical or hazardous materials.

n. Assure that only **TRAINED & AUTHORIZED** persons operate motor vehicles at a facility.

o. Assure all drivers have a valid driver's license.

p. Always turn on vehicle lights when entering storage buildings. **DO NOT ENTER** storage buildings without permission from Facility Supervisor.

q. Sound horn before entering or exiting a building with mobile equipment.

r. Do not operate mobile equipment while using cell phones.

Note: Some FPP facilities allow hands free cell phone use, but at no time is texting or emailing allowed.

s. Do not operate mobile equipment under the influence of alcohol.

Note: Some facilities require a minimum of 8 hours before working if taking alcohol.

t. Do not operate mobile equipment under the influence of drugs, including prescription drugs that warns "Caution May Cause Drowsiness" or other like worded warning must inform their supervisor.

Note: Remember, most FPP facilities require a drug test for all motor vehicle accidents.

2. General Hazards While Operating Mobile Equipment At The Phosphate Facility:

a. Falling from moving equipment;
b. Collisions due to traveling too fast for conditions;
c. Eye injury due to blowing sand or dust;
d. Crushed beneath or between moving objects;
e. Rollovers;
f. Poor road conditions;
g. Poor visibility;
h. Slipping and falling while mounting or dismounting
i. Defective equipment;

3. Unsafe Acts Associated With Mobile Equipment:

a. Improper operation of equipment;
b. Excessive speed;
c. Failure to lower driving speed when hazardous conditions are encountered or vision is limited
d. Failure to obey traffic rules, regulations, signals and warning signs;
e. Parking equipment too close to railroad tracks;
f. Failure to set brakes on unattended vehicles;
g. Improper passing procedure;
h. Using vehicles with defective safety equipment;
i. Operator inattention or carelessness;
j. Inexperienced operators;
k. Leaving vehicles unattended with motor running; and
l. Failure to use wheel chocks when required.

4. Hazards Associated With Bulldozers, Front-end Loaders, Forklifts, and Bobcats;

a. Equipment roll over;
b. Slipping and falling (especially when mounting and dismounting);
c. Colliding with other equipment;
d. Hitting pedestrians;
e. Working under buckets of equipment.
f. Approaching any equipment, without signaling your intentions to the operator.

5. Inspection.

a. Mobile equipment to be used during a shift shall be inspected by the equipment operator before being placed in operation on that shift.

b. The inspection should be recorded.

c. Defects that affect safety shall be noted on the inspection log and corrected in a timely manner if possible to prevent the creation of a hazard to persons.

d. Defects should be reported to your supervisor to determine if they affect the operation or safety of the equipment.

e. When defects make continued operation hazardous, the mobile equipment shall be taken out of service and placed in a designated area posted for that purpose, or tagged marking the defective items to prohibit further use until the defects are corrected.

6. Operators Cab.

a. The windows shall be maintained to provide visibility for safe operation.

b. If damaged windows obscure visibility necessary for safe operation, or create a hazard to the equipment operator, the windows shall be replaced or removed. Damaged windows shall be replaced if absence of a window would expose the equipment operator to hazardous environmental conditions or would affect the ability of the equipment operator to safely operate the equipment.

c. The operator's stations shall be free of materials that could create a hazard to persons by impairing the safe operation of the equipment; and

d. All control placards, warnings placards and operational charts must be in place and legible.

7. Horns and Backup Alarms.

a. Manually-operated horns or other audible warning devices provided on mobile equipment as a safety feature shall be maintained in functional condition.

b. When the operator has an obstructed view to the rear, mobile equipment shall have:

   I. A discriminating backup alarm that covers the area of obstructed view; or
   II. An observer to signal when it is safe to back up.

c. Alarms shall be audible above the surrounding noise level.

8. Transporting Persons.

Persons shall not be transported:

a. On vehicles not intended for that purpose such as the forks of a fork truck or bucket of a front end loader.

b. In beds of mobile equipment such as a pickup truck, unless:

   I. Provisions are made for secure travel, and
   II. Materials in truck bed are secured, and
   III. Personnel sit inside bed, and
   IV. Sitting on top of the loads is prohibited;

Note: Some FPP prohibit transporting personnel in the bed of the pickup even with all the above precautions.

9. Operating Speeds.

a. Operators of self-propelled mobile equipment shall maintain control of the equipment while it is in motion. Operating speeds shall be consistent with conditions of roadways, tracks, grades, clearance, visibility, and traffic, and the type of equipment used.

10. Loading, Hauling, and Unloading Supplies.

a. Equipment and supplies shall be loaded, transported, and unloaded in a manner which does not create a hazard to persons from falling or shifting equipment or supplies. In other words, it should be secured.

11. Suspended Loads.

a. Persons shall not work or pass under the buckets or booms of loaders or cranes.

12. Falling Object Protection.

a. Fork-lift trucks, front-end loaders, and bulldozers shall be provided with falling objects protective structures if used in an area where falling objects could create a hazard to the equipment operator.

b. The protective structure shall be capable of withstanding the falling object loads to which it would be subjected.

13. Roll-over protective structures (ROPS) and seat belts.

a. Roll-over protective structures (ROPS) shall be installed on:

  I. Crawler tractors and crawler loaders;
  II. Graders;
  III. Wheel loaders and wheel tractors;
  IV. Skid-steer loaders; and
  V. Agricultural tractors.

b. ROPS shall have a label permanently affixed to the structure identifying--

  I. The manufacture's name and address;
  II. The ROPS model number; and
  III. The make and model number of the equipment for which the ROPS is designed.

14. Wearing Seat Belts

a. Seat belts shall be worn by the equipment operator except that when operating graders from a standing position, the grader operator shall wear safety lines and harness in place of a seat belt.

15. Parking.

a. Mobile equipment shall not be left unattended unless the controls are placed in the park position and the parking brake, if provided, is set.

16. Servicing or Repairs.

a. Mobile equipment should be fully functional and ready for assembly and/or use when delivered to FPP property.

b. Designated facility personnel shall be contacted for approval before any major repairs or non-routine maintenance is conducted.

c. Examples of routine equipment maintenance include (but are not limited to): fluid/filter changes, normal tire and brake work/repair, hydraulic cylinder, hose, belt replacements, battery charging/replacement, replacing alternators/starters, light repairs, handrails/steps and other minor structural work, glass replacement, A/C repair, and bucket teeth/attachment cutting edge replacements.

d. When feasible, all equipment will be safely removed from FPP property before major repairs are conducted. Feasibility will be determined by a designated facility person and the contractor representative in charge of the affected piece of equipment; and be based on hazards associated with transporting as compared to the ability to safely repair the equipment on site.

e. Only trained, qualified personnel authorized to be on site shall be allowed to conduct servicing or repairs to mobile equipment on Mosaic property.

f. Equipment taken out of service for repairs will be tagged out and a barrier placed with appropriate signage (cones, barricade tape, berms, etc.) that serves to keep unauthorized personnel out of the immediate area.

g. All repairs will be done in accordance with a pre-approved Pre-Job Risk Assessment or Safe Work Procedure for that specific task.

h. Repairs will be done following lockout procedure which will address securing the key, disconnecting the battery,(i.e. Disabling the master switch or the cable connections) and all other pertinent energy control concerns (blocking, chocking, bleeding down, isolation, etc.). The procedure will also address any tasks that will require the motor to be running with reason, risk, exposure and controls. The key and work area will be under the control of the technician or mechanic at all times.

i. When servicing and performing maintenance of mobile equipment, there shall be no “over-riding of interlocks or safety features”, to assure safe and positive control of the machinery is assured while work is being performed.

j. All elevated work above 4ft will require the use of engineered or manufacturer approved fall protection systems and 100% tie off.

k. Servicing and repairs must be conducted in areas free of ground, water or other hazards. Equipment will be relocated, if possible, or additional controls will be put in place to eliminate the hazards.

TOC

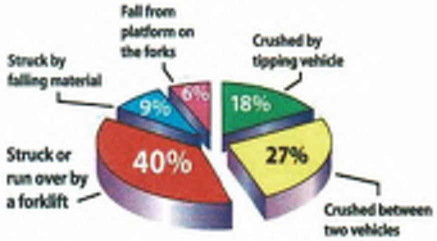
LIFT TRUCKS

Industrial Truck Standards Development Foundation (ITSDF) B56.1-2005

1. Introduction.

a. The use of powered industrial lift trucks is subject to certain hazards which can be minimized by the exercise of intelligence, care, and common sense. It is therefore essential to have competent operators, physically and mentally fit, and thoroughly trained in the safe operation of the equipment and the handling of the loads.

2. Common Hazards.



a. Serious hazards commonly occur from:

I. Overloading,
II. Instability of the load,
III. Obstruction to the free passage of the load,
IV. Collision with objects or pedestrians,
V. Poor maintenance,
VI. Use of equipment for purpose for which it was not intended or designed.

3. Markings.

a. No modifications are allowed that may affect the capacity, stability, or safe operation of the lift truck without the prior written approval of the manufacturer.

b. If equipped with a front-end attachments, the lift truck must be marked to identify the attachments and show the capacity of the truck with attachments at maximum elevation with the load laterally centered.

c. All nameplates along with caution and instruction markings must be in place and legible.

4. Training.

a. Only trained and authorized persons shall be permitted to operate a powered industrial truck. Qualification includes visual, auditory, physical, and mental ability to operate the equipment safely.

b. Training must be specific to the lift truck the employee will operate.

c. Training shall include field practice on the actual operation or simulated performance of all operating tasks such as load handling, maneuvering, traveling, stopping, starting, and other activities under the conditions that will be encountered.

d. Retraining must occur when new equipment is introduced, existing equipment is modified, operating conditions are changed, or an operator's performance is unsatisfactory.

Note: many FPP facilities require retraining at a minimum of three year intervals.

TOC

5. General Use.

a. When starting, place directional controls in neutral, disengage clutch on manual transmission trucks, or apply brake on automatic transmission trucks and electric trucks.

b. Ensure that personnel stand clear of the rear swing area before turning.

c. Exercise care at cross aisles, doorways, and other locations where pedestrians may step into the path of travel.

d. Never allow anyone to stand or pass under the elevated portion of any truck.

e. Caution should be used when operating in confined or poorly ventilated areas due to carbon monoxide.

f. Sound horn at cross aisles, entering / exiting buildings and other locations where vision is obstructed.

g. If the load being carried obstructs forward view, travel with the load trailing.

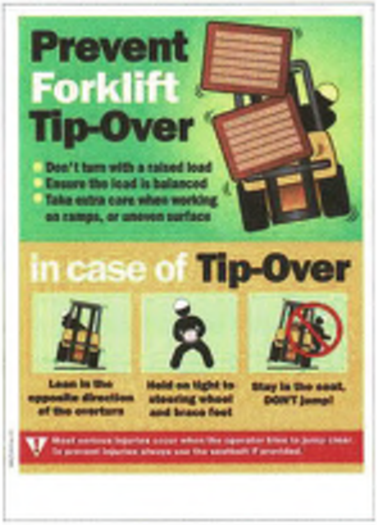
h. When ascending or descending grades in excess of 5%, trucks shall be driven with the load upgrade.

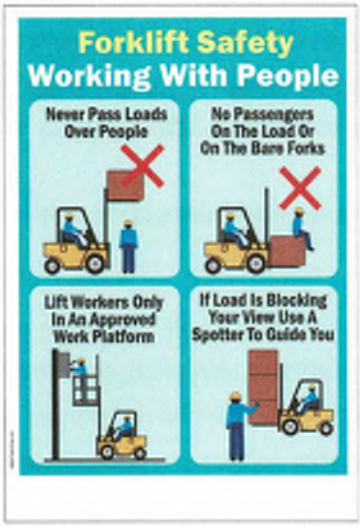
i. Loads shall be tilted back and raised only as far as necessary to clear the road surface.

j. A lift truck, loaded or unloaded, may tip over if an operator fails to slow down to a safe speed before making turns. This risk is intensified if overloaded, traveling with the load elevated, off-center positioning of the load or traveling on an uneven surface.

k. Suspended loads should use tag lines to restrain load swing whenever possible.

Forklift Safe Drive
Keep it slow, it's not a race!
Do not travel or turn with a raised load, the forklift could tip over.
Face your load uphill.
Going downhill? Travel in reverse.
Be careful of rear end swing.


Prevent Forklift Tip-Over
Don't turn with a raised load
Ensure the load is balanced
Take extra care when working on ramps, or uneven surface
in case of Tip-Over
Lean in the opposite direction of the overturn
Hold on tight to steering wheel and brace feet
Stay in the seat, DON'T jump!


Forklift Safety Working With People
Never Pass Loads Over People
No Passengers On The Load Or On The Bare Forks
Lift Workers Only In An Approved Work Platform
If Load Is Blocking Your View Use A Spotter To Guide You

CRANES

OSHA 29 CFR 1910.180 and 1926.1400

1. Operator Training.

a. General Industry Standard:

- I. OSHA's general industry standard states "Only designated personnel shall be permitted to operate a crane. No specific training requirements are mandated, but as with all mobile equipment, the employee must receive training on the specific type of equipment being used, know the safety features, is aware of all limitations of the crane and be knowledgeable of the 1910.180 standard.

Note: FPP facilities require documentation of the training.

- II. Crane operators are required to be familiar with the operation's manual for the type of crane they are operating.

b. Construction Standard:

- I. The construction standard was revised in 2010. Operators of most cranes above 2,000 lb. capacity when used in construction will need to be either certified by an accredited crane operator testing organization, such as the National Commission for the Certification of Crane Operators (NCCCO), or qualified through an audited employer program.
- II. Several types of cranes are exempt from this such as:
  - A. Cranes with a rated capacity of 2000 lb. or below.
  - B. Maintenance or service vehicles with a hoist used just for that purpose.
  - C. Articulating truck cranes when used purely to deliver materials. However, when they are used to hold, support, or stabilize material for a construction activity, or are handling prefabricated components (e.g. roof trusses / wall panels) or structural steel, they are covered.

- III. Rule took effect November 8, 2010. Employers must be in compliance by November 10, 2017.

Note: Many FPP facilities require the certification before 2017 for most lifts.

- IV. Signal Person Training:
  - A. All signal persons must be qualified and tested through a written or oral test and a practical test, and the qualification must be documented.
  - B. Qualification can be either through a third-party qualified evaluator or through an employer's qualified evaluator.
- V. Qualified Rigger Training:
  - A. A qualified rigger is needed during assembly/disassembly of cranes, when employees are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure.
  - B. A qualified rigger is defined as a "qualified person" who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve/resolve problems relating to rigging.
  - C. While they still need to be trained (and therefore evaluated), they do not have the same specified requirements for testing and documentation as signal persons.

2. Crane Lift Plan/Permit Is Required:

a. When more than one crane /derrick will be supporting the load.
b. During personnel lifting.
c. When there is a potential of encroachment of the minimum distance to electrical transmission/distribution lines.
d. Crane capacity is 80 per cent or above.
e. When lifting over process equipment.
f. When the Controlling Entity, Lift Director, Project Manager or Professional Engineer determine a lift plan is required.

Note: Some FPP facilities require a lift permit for all crane lifts except for unloading material. It is important to remember that a Job Safety Review may still be required for unloading material with a crane or hoist.

3. Common Crane Violations:

OSHA® Compliance

a. Signal Person not qualified.
b. Materials not rigged by Qualified Rigger.
c. No annual inspections performed by a qualified person.
d. No determination for working radius closer than 20 feet to a power line.
e. Operators manual, load charts, hazard warnings, etc., not in the cab at all times.
f. Missing labels supplied by the manufacturer.
g. Monthly crane inspection results, missing or signed documentation not maintained.
h. A determination for safety was not made by competent person after a deficiency was noted during a visual inspection.
i. Inspections not performed annually by a qualified person.

4. Common Causes of Crane Accidents:

a. The maximum weight is exceeded due to poor planning or not aware of the load being lifted.
b. Lack of training for either the operator, signal person or rigger.
c. Working under a suspended load or being in the hazard zone.
d. Failure to barricade off the swing radius of the crane to prevent unauthorized entry.
e. Struck by crane boom.
f. Contact with overhead power lines.
g. Flawed or infrequent inspections.
h. Falling off the crane during maintenance or set up.

5. General Safety

a. No modifications or additions, which affect the capacity or safe operation of the equipment, shall be made by the employer without the manufacturer's written approval.
b. An accessible fire extinguisher of 10BC rating, or higher, shall be available at operator station or cab.
c. An illustration of the hand signals shall be posted at the lifting controls.

TOC

RIGGING

Properly labeled

1. Wire Rope.

a. Wire ropes deteriorate and will break if left in service too long. Causes of rope deterioration may include wear, peening (hammer action), corrosion, bending, flexing, kinking, and crushing, overloading and heat damage.

b. Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

c. Employers must use only wire-rope slings that have permanently affixed and legible identification markings that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, and the number of legs if more than one.

d. Leather gloves must always be used when handling wire rope.

e. When used for eye splices, the U-bolt shall be applied so that the "U" section is in contact with the dead end of the rope.

f. Slings shall not be shortened with knots or bolts or other makeshift devices.

g. Slings used in a basket hitch shall have the loads balanced to prevent slippage.

h. Slings shall be padded or protected from the sharp edges and attachment points.

i. Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.

j. Shock loading is prohibited.

k. A sling shall not be pulled from under a load when the load is resting on the sling.

2. Wire Rope Used In Crane Operations.

a. Shall be taken out of service when any of the following conditions exist:

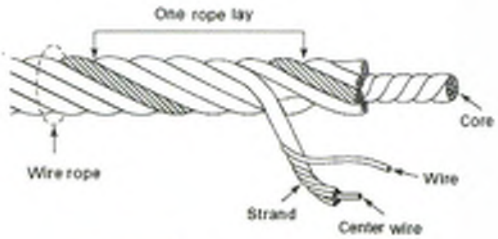
  I. In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay

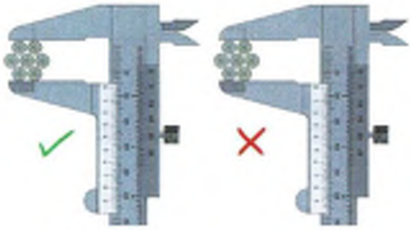
  II. In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

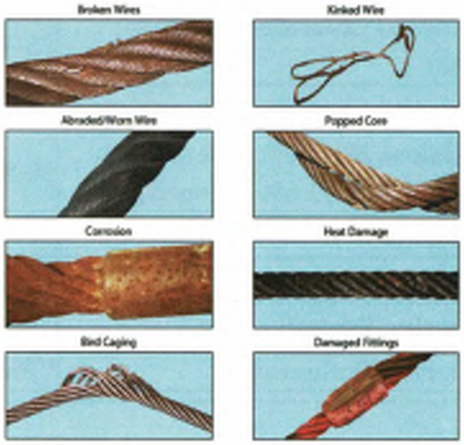
  III. Crushing, bird caging, or any other damage resulting in distortion of the rope structure.

  IV. Evidence of any heat damage from any cause.

  V. Reductions from nominal diameter in the wire rope per rope manufactures specifications.







APPENDIX A – LIST OF HIGHLY HAZARDOUS CHEMICALS, TOXICS AND REACTIVES (MANDATORY)

(29 CFR 1910.119 Appendix A)

*: Chemical Abstract Service Number **: Threshold Quantity in Pounds
(Amount necessary to be covered by this standard)

This Appendix contains a listing of toxic and reactive highly hazardous chemicals which present a potential for a catastrophic event at or above the threshold quantity.

CHEMICAL NAME	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-68-6	250
Allyl Cholride	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (greater than 44% by weight)	7664-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonia Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis (Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7726-95-6	1500
Bromine Chloride	13863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Fluoride	353-50-4	2500
Cellulose Nitrate (concentration greater than 12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentrafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000

APPENDIX A – LIST OF HIGHLY HAZARDOUS CHEMICALS, TOXICS AND REACTIVES (MANDATORY) cont.

*: Chemical Abstract Service Number **: Threshold Quantity in Pounds
(Amount necessary to be covered by this standard)

CHEMICAL NAME	CAS*	TQ**
Chlorodiethylaluminum (also called Diethylaluminum Chloride)	96-10-6	5000
1-Chloro-2, 4-Dinitrobenzene	97-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropierin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Commune Hydroperoxide	80-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Diacetyl Peroxide (concentration greater than 70%)	110-22-5	5000
Diazomethane	34-88-3	500
Diabenzoyl Peroxide	96-36-0	7500
Diborane	192887-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichlorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilauroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Dimethylhydrazine,1, 1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Keone Peroxide; concentration greater than 60%)	1338-23-4	5000
Ethyl Nitrite	109-95-5	5000
Ethylamine	75-04-7	7500
Ethylene Fluorohydrin	371-62-0	100

TOC

APPENDIX A – LIST OF HIGHLY HAZARDOUS CHEMICALS, TOXICS AND REACTIVES (MANDATORY) cont.

*: Chemical Abstract Service Number **: Threshold Quantity in Pounds
(Amount necessary to be covered by this standard)

CHEMICAL NAME	CAS*	TQ**
Ethylene Oxide	75-21-8	5000
Ethyleneimine	151-56-4	1000
Fluorine	7782-41-4	1000
Formaldehyde (Formalin)	50-00-0	1000
Furan	110-00-9	500
Hexafluoroacetone	684-16-2	5000
Hydrochloric Acid, Anhydrous	7647-01-0	5000
Hydrofluoric Acid, Anhydrous	7664-39-3	1000
Hydrogen Bromide	10035-10-6	5000
Hydrogen Chloride	7647-01-0	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000
Hydrogen Fluoride	7664-39-3	1000
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500
Hydrogen Selenide	7783-07-5	150
Hydrogen Sulfide	7783-06-4	1500
Hydroxylamine13463-40-6	7803-49-8	2500
Iron, Pentacarbonyl	13463-40-6	250
Isopropylamine	75-31-0	5000
Ketene	463-51-4	100
Methacrylaldehyde	78-85-3	1000
Methacryloyl Chloride	920-46-7	150
Methacryloyloxyethyl Isocyanate	30674-80-7	100
Methyl Acrlonitrile	126-98-7	250
Methylamine, Anhydrous	74-89-5	1000
Methyl Bromide	74-83-9	2500
Methyl Chloride	74-87-3	15000
Methly Chloroformate	79-22-1	500
Methyl Ethyl Ketone Peroxide (concentration greater than 60%)	1338-23-4	5000
Methyl Fluoroacetate	453-18-9	100
Methyl Fluorosulfate	421-20-5	100
Methyl Hydrazine	60-34-4	100
Methyl Iodide	74-88-4	7500
Methyl Isocyanate	624-83-9	250

APPENDIX A – LIST OF HIGHLY HAZARDOUS CHEMICALS, TOXICS AND REACTIVES (MANDATORY) cont.

*: Chemical Abstract Service Number **: Threshold Quantity in Pounds
(Amount necessary to be covered by this standard)

CHEMICAL NAME	CAS*	TQ**
Methyl Mercaptan	74-93-1	5000
Methyl Vinyl Ketone	79-84-4	100
Methyltrichlorosilane	75-79-6	500
Nickel Carbonly (Nickel Tetracarbonyl)	13463-39-3	150
Nitric Acid (94.5% by weight or greater)	7697-37-2	500
Nitric Oxide	10102-43-9	250
Nitroaniline (para Nitroaniline)	100-01-6	5000
Nitromethane	75-52-5	2500
Nitrog)en Dioxide	10102-44-0	250
Nitrogen Oxides (NO; NO(2); N204; N2O3)	10102-44-0	250
Nitrogen Tetroxide (also called Nitrogen Peroxide)	10544-72-6	250
Nitrogen Trifluoride	7783-54-2	5000
Nitrogen Trioxide	10544-73-7	250
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid)	8014-94-7	1000
Osmium Tetroxide	20816-12-0	100
Oxygen Difluoride (Fluorine Monoxide)	7783-41-7	100
Ozone	10028-15-6	100
Petaborane	19624-22-7	100
Peracetic Acid (concentration greater 60% Acetic Acid; also called Peroxyacetic Acid)	79-21-0	1000
Perchloric Acid (concentration greater than 60% by weight)	7601-90-3	5000
Perchloromethyl Mercaptan	594-42-3	150
Perchloryl Floride	7616-94-6	5000
Peroxyacetic Acid (concentration greater than 60% Acetic Acid; also called Peracetic Acid)	79-21-0	1000
Phosgene (also called Carbonyl Chloride)	7803-51-2	100

APPENDIX A – LIST OF HIGHLY HAZARDOUS CHEMICALS, TOXICS AND REACTIVES (MANDATORY) cont.

*: Chemical Abstract Service Number **: Threshold Quantity in Pounds
(Amount necessary to be covered by this standard)

CHEMICAL NAME	CAS*	TQ**
Phosphorus Trichloride	7719-12-2	1000
Phosphorus Chloride (also called Phosphorus Oxychloride)	10025-87-3	1000
Propargyl Bromide	106-96-7	100
Proply Nitrate	627-3-4	2500
Sarin	107-44-8	100
Selenium Hexafluoride	7783-79-1	1000
Stibine (Antimony Hydride)	7803-52-3	500
Sulfur Dioxide (liquid)	7446-09-5	1000
Sulfur Pentafluoride	5714-22-7	250
Sulfur Tetrafluoride	7783-60-0	250
Sulfuric Trioxide (also called Sulfuric Anhydride)	7446-11-9	1000
Sulfuric Anhydride (also called Sulfur Trioxide)	7446-11-9	1000
Tellurium Hexafluoride	7783-80-4	250
Tetrafluoroethylene	116-14-3	5000
Tetramethyl Lead	75-74-1	1000
Thionyl Chloride	7719-09-7	250
Trichloro (chloromethyl) Silane	1558-25-4	100
Trichloro (dichlorophenyl) Silane	27137-85-5	2500
Trichlorosilane	10025-78-2	5000
Trifluorochloroethylene	79-38-9	10000
Trimethyoxysilane	2487-90-3	1500

TOC

NOTES:

[NH_3 → 10,000 lbs   137 process chem → pg 148 Osha.
[SO_3 → 1,000 lbs
↳ 2 chemicals above TQ ↗ found in Mosaic Facilities.
Anhydrous Ammonia + Sulfur Trioxide.

FYI
Hearing Protection any time ≥ 85 dba, double Hearing Protection @ 105 dba

Hearing protection – all of the above.. wearing rings on fingers prohibited.

LOTO – Safe work Permit.

Auto-retracting for cutting tool

fertilizer → Phosphate + Pot Ash + Nitrogen

Mobile Equip – Spotter when Back up alarm or horn doesn't work
or when Hauling Equipment and forward view is
obstructed.

46 on test ↗
Fork Lift →